ENGRAVER

EG1400/EN-400A

EG1400-UM-251-01-9370

SERVICE MANUAL

GRAPHTEC

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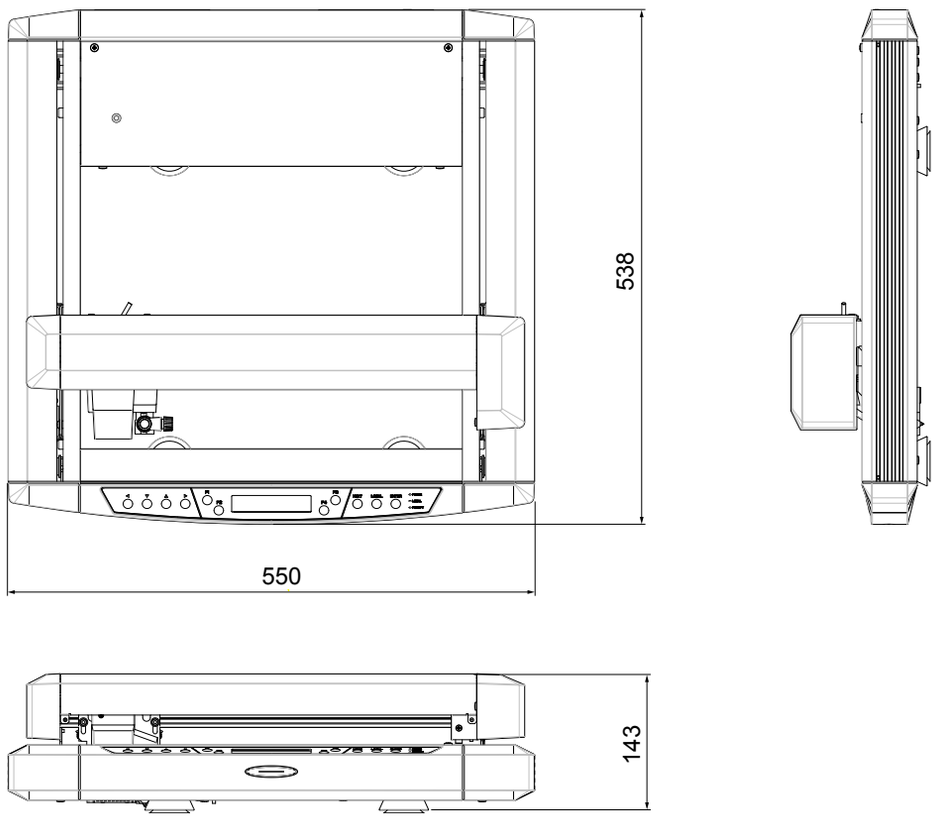
1. INTRODUCTION

1.1 Main Specifications

Model	EG1400	EN-400A
CPU	32-bit CPU	
Configuration	Flatbed type	
Drive system	Fully-digital servo (all directions: X,Y, and Z axes)	
Fixing method	Suction cup method (Suction by compressed air) Ensures engraver's horizontal specification	
Compressed air specification	Flow rate: 20 ℓ /㎜ or more Pressure: 0.5 to 0.7 Mpa	
Up-and-down adjustable range of engraving mechanism	Adjustable between 0 to 10 mm max.	
Size of medium	When suction cups are used: 350 mm x 390 mm or more	
	A4 size or less: 210 mm x 297 mm max.	
Maximum speed	100 mm/s	
Engraving method	Dot-engraving method using engraving blade (The engraving blade is secured to the plunger. The engraving blade is exchangeable.)	
Blade's impact force	600 g max. (Maximum impact in static state)	
Engraving depth	0 to 0.2 mm Note: The engraving depth depends on the material.	
Mechanical step size	0.005 mm	
Application	Adobe Photoshop Ver. 7.0	
OS	Windows 98 / Me / 2000 / XP	
Image resolution	Switches between 72 / 75 / 144 / 150 dpi (Windows driver)	
Image gradation	Binary: Black and white	
Repeatability	0.19 mm / 297 mm or less	
Distance accuracy	Travel amount x 0.1% or less	
Perpendicularity	0.19 mm / 297 mm or less	
Mountable pen tip	One (Dedicated plunger for engraving blade)	
Material of engraving blade	Supersteel	
Interfaces	On-line: USB (Ver 1.1) Off-line: Memory card system (For CF card only) Guaranteed manufacturer: SanDisk, 32 MB / 64 MB	
Buffer capacity	2 MB	
Data format	Dedicated Graphtec commands Note: Only data received through the Windows driver supplied as a standard accessory is guaranteed.	
LCD	20 characters x 2 lines	
Rated power-supply voltage	100 to 230 V AC±10%, 50 / 60 Hz	
Power consumption	40 VA or less	
Operating temperature range	5°C to 35°C	
Operating humidity range	35% to 75% (non-condensing)	
Guaranteed precision range	10°C to 35°C	
Dimensions (approximate)	550 mm (W) x 538 mm (D) x 143 mm (H)	
Weight (approximate)	10 kg	

1.2 External Dimensions

EG1400/EN-400A



Units: mm

Dimensional accuracy: ±5 mm

2. PARTS NAMES and FUNCTIONS

2.1 Parts Names and Functions

Pen carriage.....Drives the engraving blade back and forth.

Pen holder.....Holds the engraving blade and drives it up/down.

Y bar .....Holds the pen carriage; moves left/right.

Control panel.....Used to operate and set the engraver's various functions.

USB interface .....Used to connect a computer to the engraver via a USB interface.

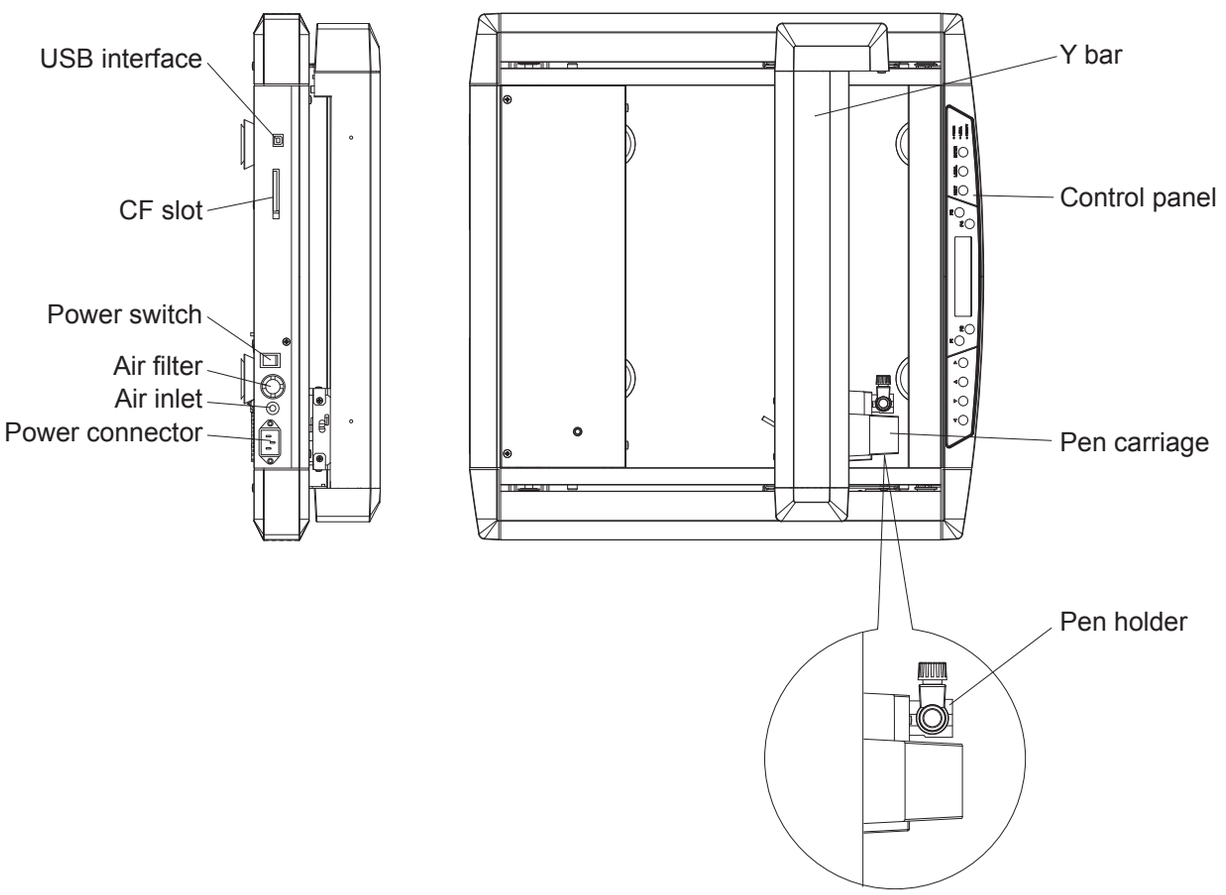
CF slot .....This slot is used by the compact flash (hereinafter referred to as CF) card, when operating the engraver off-line.

Power connector.....Connector for the power cable.

Power switch .....Used to switch the engraver power on.

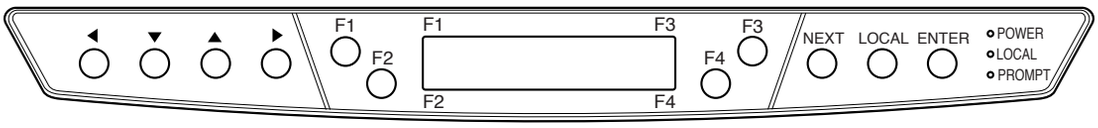
Air filter .....Filters the compressed air supplied to the engraver. Remove this air filter when replacing the element.

Air inlet.....Connects to the air supply tube (ø6).



3. OPERATIONS

3.1 Control Panel



Indicator Lamps

POWER lamp ..... The POWER lamp remains lit while the power is on.

LOCAL lamp..... The LOCAL lamp lights when the LOCAL key is pressed. The lamp turns off when the LOCAL key is pressed again.

PROMPT lamp ..... The PROMPT lamp lights when the engraver receives data that will cause the pen carriage to move outside the effective engraving area.

POSITION Keys

◀▼▲▶

These POSITION keys function differently according to the engraver's operating status. They are used to change a setting on a displayed menu during the Local mode, and are used to move the pen carriage at all other times. When a key is pressed, the pen carriage first moves slowly. When you continue to hold down the key, the pen carriage starts moving more quickly.

Function Keys

F1.....Press the F1 key to select a function in Local mode, or to select data in Ready mode when a CF card is inserted.

F2.....Press the F2 key to select a function in Local mode, or to select a material in Ready mode.

F3.....Press the F3 key to select a function in Local mode.

F4.....Press the F4 key to select a function in Local mode, or to check the engraving area in Ready mode when a CF card is inserted.

Menu Keys

NEXT.....Press this key in Local mode to proceed to the next menu page.

LOCAL .....Press this key to switch the engraver from Ready mode to Local mode. When this key is first pressed, the engraver goes into Local mode and the LOCAL lamp (green) lights on the right of the control panel. When this key is pressed again, the engraver goes into Ready mode and the LOCAL lamp turns off. (If this key is pressed during engraving, the engraver goes into Local mode after engraving is complete.) To set a function, press this key to switch to Local mode. If data is received after this key is pressed, it is tentatively stored in the data buffer.

ENTER .....Press this key to save each setting.

3.2 Menu List

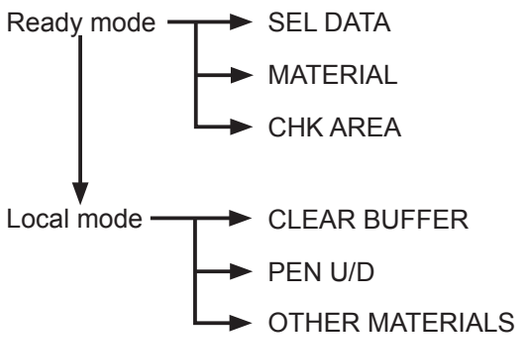
The menus of this engraver are displayed in English (Alphabet) by the factory setting.

If necessary, change the English display to Japanese (Kata-kana) display using the following procedure:

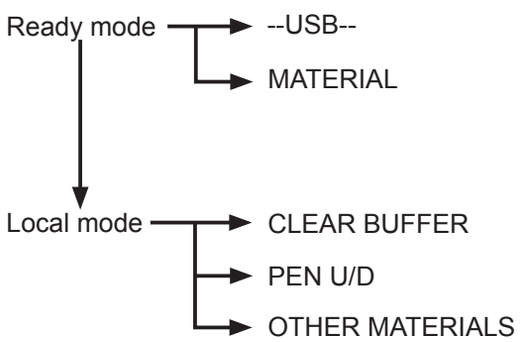
Turn the power on while pressing the F1 key : Display in Japanese (Kata-kana)

Turn the power on while pressing the F3 key : Display in English (Alphabet)

3.2.1 Menu list (When the memory card is inserted)



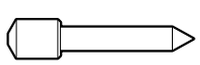
3.2.2 Menu list (When the memory card is not inserted)



3.3 Engraving Blade and Plunger

3.3.1 Engraving blade

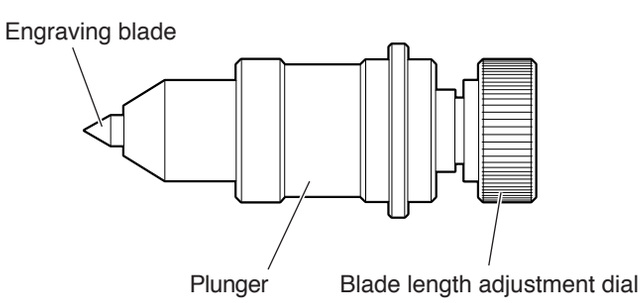
Model name : EGB-332U-K60



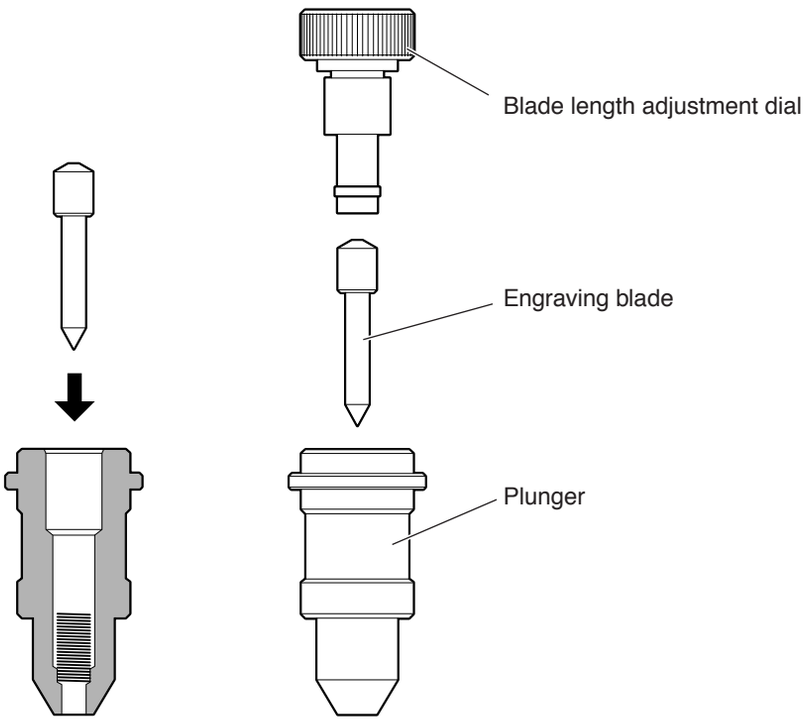
3.3.2 Nomenclature of Engraving Pen

Model name : EGP-B30-3

The blade is mounted into the plunger for use.



3.3.3 Replacing the Engraving Blade



Procedure

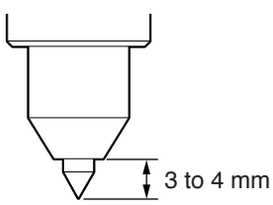
(1) Turn the blade length adjustment dial in the counterclockwise direction to unscrew it from the plunger.

(2) Remove the blade inside the plunger.

(3) Take a new blade and insert it into the opening in the plunger.

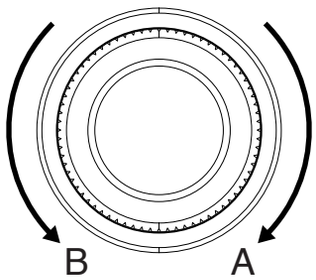
(4) Turn the blade length adjustment dial in the clockwise direction to attach it to the plunger.

(5) Adjust the blade length so that the blade tip is visible 3 to 4 mm from the plunger.

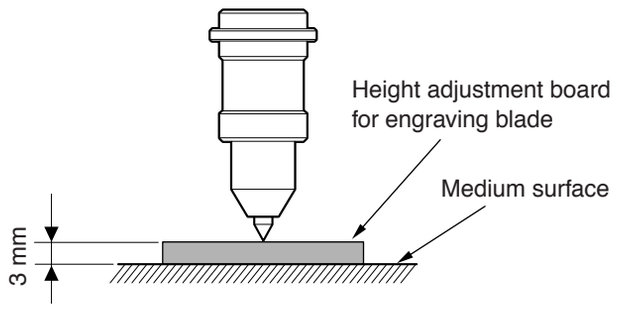


3.3.4 Adjusting the Blade Length

(1) Adjusting the blade length by turning the blade length adjustment dial. To extend the blade, turn the knob in the A direction. To retract the blade, turn it in the B direction.

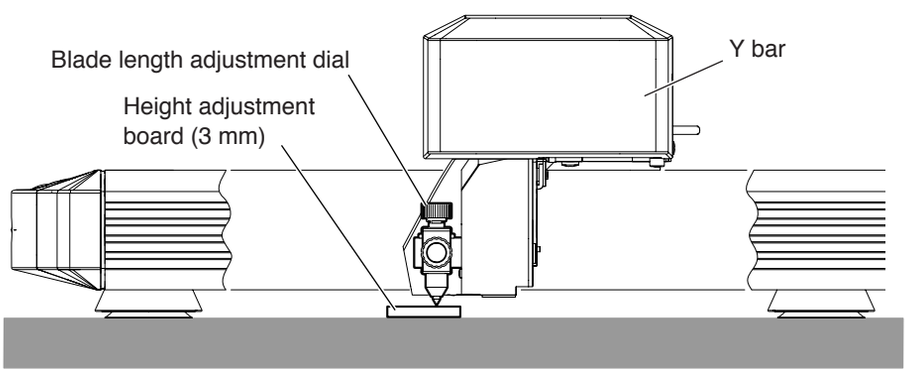


(2) Turn the power on. When the initialization is complete, place the supplied height adjustment board on the surface of the medium. Then adjust the engraving pen with the pen holder using the adjustment dial, until its tip touches to the height adjustment board (i.e. the tip will be 3 mm from the medium).



3.3.5 Adjusting the Height of the Engraving Pen and Pen Carriage

For a Large Medium:



(1) Place the supplied 3 mm height adjustment board for the engraving blade on the material to be engraved. Then adjust the distance between the engraving blade tip and the material to about 3 mm, using the height adjustment board and the blade length adjustment dial.

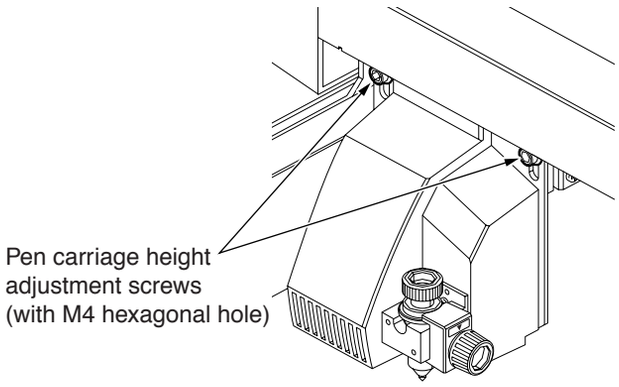
⚠ CAUTION

If the visible tip of the engraving blade is too short, the blade length adjustment dial may fall off. Ensure that 3 to 4 mm of the engraving blade is visible from the plunger.

For a small medium:

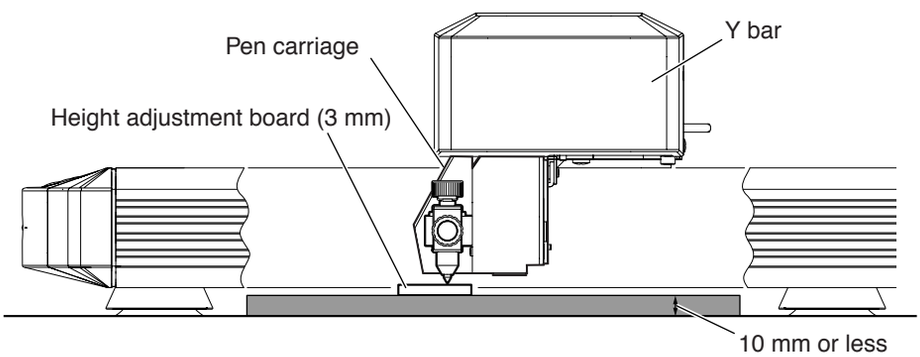
The factory setting of the pen carriage is the lowest position.

To go beyond the range allowed by the blade length adjustment dial, perform the following steps: Switch the power of the engraver off. Then loosen the screws shown in the illustration below, using the supplied M4 Allen wrench. Adjust the distance between the medium and the blade tip to about 3 mm, using the height adjustment board.



(1) Prepare a flat surface such as a table larger than the area of the engraver's suction cups.

(2) Place the material to be engraved on it. (Secure the material with double-sided tape. Do not use too much tape; it may be difficult to peel off afterwards. A piece of 2 cm x 2 cm double-sided tape on each corner should be sufficient.)



⚠ CAUTION

For a medium smaller than the area of the engraver's suction cups, this engraver is designed to engrave on a thickness of 10 mm or less. Be sure to use a medium with a thickness of 10 mm or less.

(3) As in the procedure for a large medium, adjust the distance between the medium and the blade tip to about 3 mm, using the height adjustment board.

⚠ CAUTION

If the visible tip of the engraving blade is too short, the blade length adjustment dial may fall off. Ensure that 3 to 4 mm of the engraving blade is visible from the plunger.

3.3.6 Engraving Blade Conditions

(1) Impact force (default)

Depending on the material, the impact force is set as follows:

Material	Impact force
STONE	30 (About 265 g)
GRANITE	28 (About 230 g)
METAL	32 (About 310 g)
OTHER	18 (About 90 g)

The maximum impact force is 48 (about 600 g).

(2) Relationships between values and impact forces (The g values are approximate.)

Set value	20	25	30	35	40	48
Impact force	130 g	175 g	265 g	380 g	500 g	600 g

(3) Condition setting points

	Larger	**Smaller**
Impact Force	The diameter of the engraved hole increases. The image becomes brighter than the standard engraved image.	The diameter of the engraved hole decreases. The image becomes darker than the standard engraved image.
Blade tip wear level	The diameter of the engraved hole increases. The image becomes brighter than the standard engraved image. When the blade tip becomes very worn, the image quality deteriorates.	The diameter of the engraved hole decreases. The image becomes darker than the standard engraved image.
Distance from the medium	Same as when the impact force is greater; the image becomes brighter. Also, the engraving time tends to be a little longer.	Same as when the impact force is less; the image becomes darker. Also, the engraving time tends to be a little shorter.
Blade tip angle	The diameter of the engraved hole increases. The image becomes brighter than the standard engraved image.	The diameter of the engraved hole decreases. The image becomes darker than the standard engraved image.

3.4 Printing a List of the Currently Selected Conditions

Use this function to print out a list of the engraver's currently selected conditions. A sample printout is shown below.

(1) Mount a plotting pen at the engraver's pen holder and then set the FORCE, SPEED, and QUALITY to suit the pen mounted.

(2) Load paper of at least A4 size in the engraving area.

(3) Turn the power on while pressing the ▼ key.

(4) Press the LOCAL key.

(5) Press the NEXT key twice.

(6) Press the F3 key (SPECIAL).

(7) Press the F4 key (PRINT CONDITIONS) to initiate printing of a list of the engraver's currently selected conditions.

EG1400 CONDITIONS

CONDITION	FORCE	SPEED	PEN TYPE	OFFSET	ACCEL	PEN No.
*1	15	10	EGB332	0	2	1
2	28	10	EGB332	0	2	1
3	32	10	EGB332	0	2	1
4	18	10	EGB332	0	2	1

COMMAND	HP-GL	HP-GL ORIGIN	LOWER LEFT
PEN UP SPEED	AUTO	STEP PASS	0
OFFSET FORCE	4	OFFSET ANGLE	30
ROTATE	OFF	MIRROR	OFF
DISTANCE ADJUST	0.00%,	0.00%	
DISPLAY UNIT	mm	PEN SORT	OFF

CONDITION	THICK	MODE	OVERCUT1	OVERCUT2
1	OFF	1	0.0mm	0.0mm
2	OFF	1	0.0mm	0.0mm
3	OFF	1	0.0mm	0.0mm
4	OFF	1	0.0mm	0.0mm

MARK MODE	OFF	MARK TYPE	1
MARK SIZE	15mm	MARK DIST. ADJ.	USER
MARK OFFSET	0.0mm,	0.0mm	

:,: COMMAND	ENABLED	W COMMAND	PEN UP
MODEL EMULATED	7550	COND. PRIORITY	MANUAL
J,SP COMMAND	DISABLED	INIT. BLADE CTRL	2mm BELOW
PEN UP MOVE	DISABLED	CARICE CHECK	DISABLED

ROM VERSION	1.01	
DOWNCOUNT	00000000	00000000

4. Daily Maintenance

4.1 Daily Maintenance

During the course of daily engraving operation, be sure to observe the following precautions.

(1) Never lubricate the mechanisms of the engraver.

(2) If the engraver's casing becomes dirty, wipe the soiled areas using a dry cloth or a cloth that has been moistened in a neutral detergent diluted with water.

4.2 REPLACING CONSUMABLE SUPPLIES

4.2.1 Changing the Suction Cups Securing the Engraver

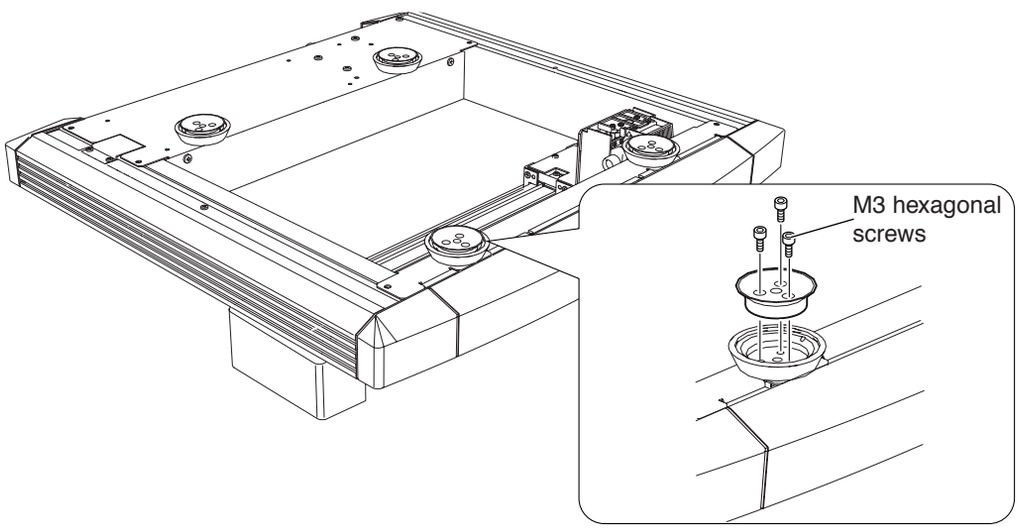
The suction cups that secure the engraver must be replaced periodically since the rubber deteriorates over time.

Use the following procedure to change the suction cups.

(1) Remove the three M3 hexagonal screws from the suction cup using the supplied M3 Allen wrench, and remove the suction cup.

(2) Attach a new suction cup in the reverse order of the removal procedure.

Be sure to use all three screws to tightly secure the suction cup. Missing or loose screw(s) may cause air in the suction cup to leak, making the engraver unstable.



4.2.1 Changing the Filter Element for the Air Supply

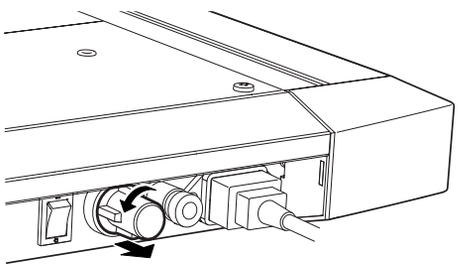
This engraver has a filter for the supplied air. After prolonged use, the element in the filter deteriorates and must be replaced. The amount of contamination and length of time depend on the type of the compressor, condition of the compressed air, and environment.

Use the following procedure to change the element.

⚠ WARNING

Before replacing the element, be sure to stop the compressed air supply and disconnect the air-supply tube to equalize the inner pressure of the filter. If this is not done, the filter cover may be ejected by the force of the compressed air. This is dangerous. Be sure to stop the compressed air supply before proceeding. (The filter is located next to the air inlet on the back of the engraver.)

(1) Hold the transparent cover of the filter, and turn it counterclockwise (about 45°) until it stops. In this position, withdraw the transparent cover. The element can then be replaced.



(2) With the transparent cover removed, hold the element (white part) and pull it out to remove it. Remove dust from inside the transparent cover using an air-blower.

(3) Install a new element.

(4) Replace the O-ring attached to the transparent cover with a new one. Since the O-ring is made of rubber, it will stretch like a rubber band. Hold and pull it to remove. (If the O-ring is severely deteriorated, the rubber becomes hard and may be cracked or cut. In that case, remove the old O-ring completely from the cover before installing a new O-ring.)

(5) Install a new O-ring in the reverse order of the removal procedure.

⚠ WARNING

When the transparent cover is simply pushed back in, it is not locked. After inserting, be sure to turn the cover clockwise (45°), and confirm it is locked. Also after an element replacement, be sure to confirm the transparent cover is locked before compressed air is supplied. If not, the filter cover may be ejected by the force of the compressed air. This is dangerous. Be sure to confirm that the transparent cover is locked before compressed air is supplied.

For information about purchasing the consumable supplies (suction cups, element / O-ring), contact: SMC Corporation http://www.smcworld.com/

Suction cups	ZP40HE
Element / O-ring	I-34S-A

5. RECOMMENDED PARTS LIST

No.	Part No.	Description	Q'ty	Remarks
1	771824500	Main Board (PR290701)	1	
2	500051585	Power Supply	1	
3	618242110	X-Belt	2	
4	771824570	X-Motor Assy	1	UGFMED-B5LGRA5
5	618243092	Y-Belt	1	
6	771824580	Y-Motor Assy	1	UGFMED-B5TGRA5
7	618243240	Wiper	4	
8	618243240	Bearing 624ZZ	7	X-drive shaft
9	798240703	Y-Relay Board (PR290707)	1	
10	692123330	Wiper (X slider)	6	
11	618242240	Slider Roller Bearing L	3	
12	618242310	Slider Roller Bearing S	6	
13	798240700	Pen Block Assy	1	
14	305602005	Air Filter ZFB100-M6	1	
15	618249010	Pen Height Adjustment Board	1	
16	682123210	X-Home Sensor Board	1	

6. LIST OF TOOLS

6.1 Tools

No.	Adjustment Item	Jig	Tool
1	Pen force adjustment	Engraver Pen Holder (EGP-B30-3)	Colex gauge (50,300,500 gf)
2	Distance adjustment	Ceramic Pen (ø0.2 mm)	Glass scale (500 mm)
3	Pen block height adjustment	Height Plate (P/N 618249010)	
4	Firmware update	Firmware, Driver (OPS651)	PC, Centronics I/F cable
5	X-drive belt tension adjustment	Wire	Push-pull gauge (2 kg)
6	Y-drive belt tension adjustment	Wire	Push-pull gauge (2 kg)

6.2 Greasing And Gluing Points

No.	Grease or Glue Point	Grease or Glue name	Application quantity
1	Y tension bracket M3 screws	Screwlock adhesive 1401B	Suitable quantity
2	Y-Motor pulley set screws	Loctite 222	Suitable quantity
3	Y-Rail	Shell Alvania Grease AV2	Suitable quantity
4	Y-Rail rubber stopper M3 screws	Screwlock adhesive 1401B	Suitable quantity
5	Under cover stopper shaft C	Loctite 242	Suitable quantity
6	X-Motor pulley set screws	Loctite 222	Suitable quantity
7	Y tension arm M3 screws	Screwlock adhesive 1401B	Suitable quantity
8	Y tension bracket M3 screws	Screwlock adhesive 1401B	Suitable quantity
9	Y-motor plate screws	Screwlock adhesive 1401B	Suitable quantity
10	X-Rail rubber stopper M3 screws	Screwlock adhesive 1401B	Suitable quantity
11	X-slider horizontal pressure arm M3 screws	Loctite 222	Suitable quantity

6.3 Subparts List

No.	Where used	Subpart name	
1	Control panel flexible cable	Double-sided adhesive tape, Teflon tape	Nitto #500 Teflon tape (Nitto 973UL)
2	X flexible cable	Double-sided adhesive tape	Nitto #500
3	Y flexible cable	Double-sided adhesive tape	Nitto #500

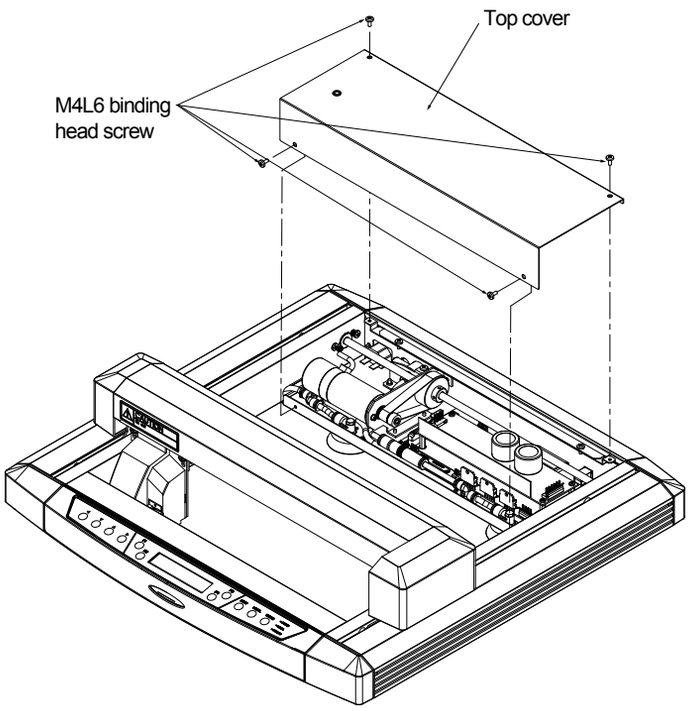
7. DISASSEMBLY AND REASSEMBLY

7.1 Exterior Parts

7.1.1 How to Replace the Top Cover

How to detach the top cover

(1) Remove the four M4L6 binding head screws from the top cover.



How to reinstall the top cover

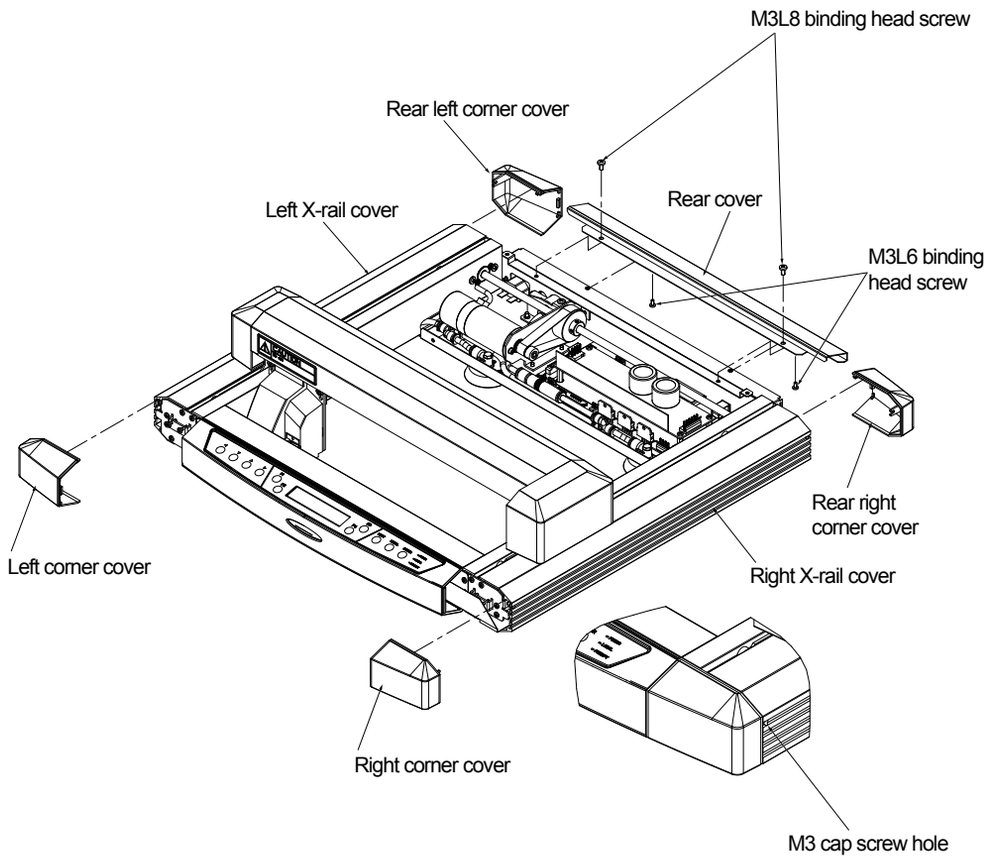
(1) Reattach the top cover in the reverse order in which it was detached.

7.1.2 How to Replace the Corner Covers

How to detach the corner covers

(1) Loosen the M3 cap screws (do not remove these screws) from the corner of the left X-rail cover's hole or the right X-rail cover's hole.

(2) Detach the corner covers.



How to reinstall the corner covers

(1) Reattach the corner covers in the reverse order in which they were detached.

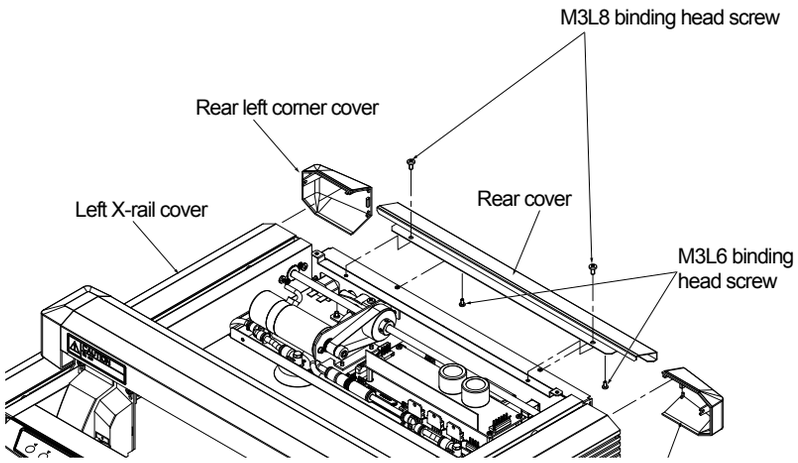
7.1.3 How to Replace the Rear Covers

How to detach the rear corner covers

(1) Detach the top cover (see Subsection 7.1.1).

(2) Remove the two M4L8 binding head screws from the top of the rear cover and then remove the two M3L6 binding head screws from the bottom of the rear cover.

(3) Detach the rear cover.



How to reinstall the rear cover

(1) Reattach the rear cover in the reverse order in which it was detached.

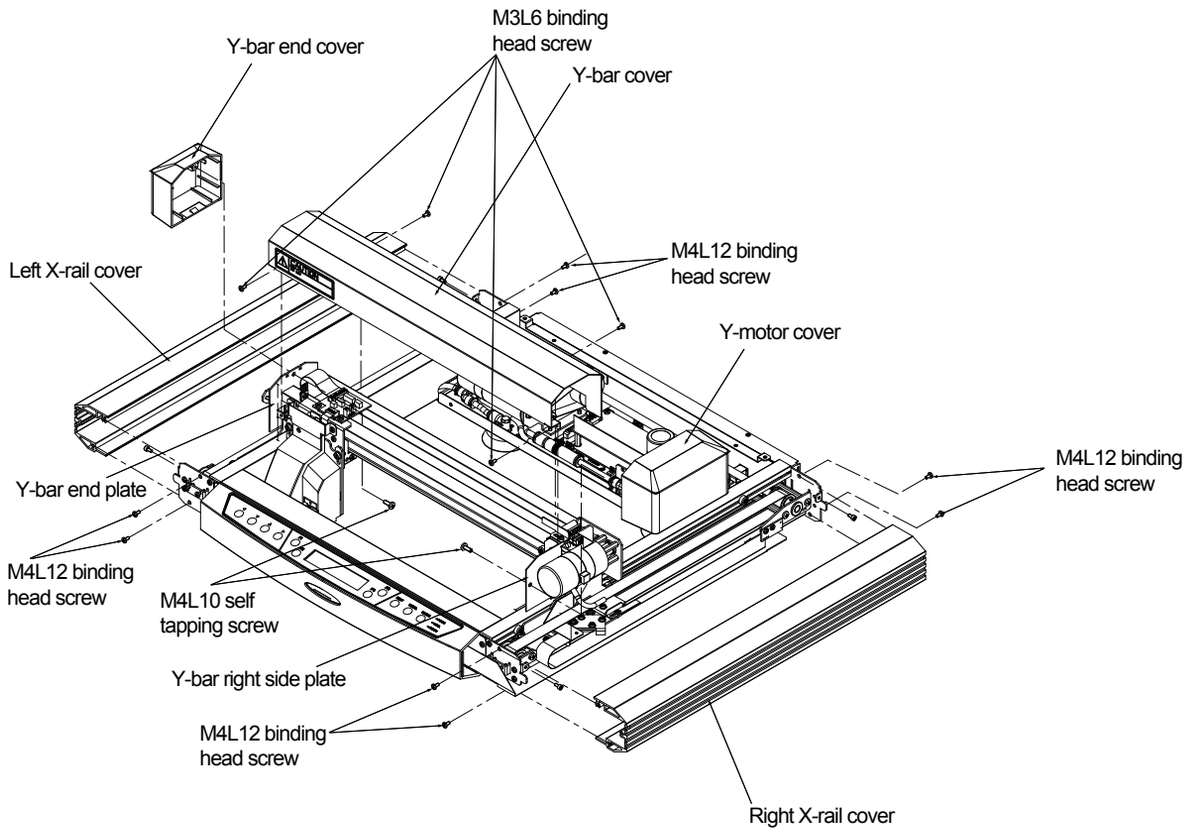
7.1.4 How to Replace the Right X-rail Cover

How to detach the right X-rail cover

(1) Detach the right corner cover and rear right corner cover (see Subsection 7.1.2).

(2) Remove the four M4L12 binding head screws from the right X-rail cover.

(3) Detach the right X-rail cover.



How to reinstall the right X-rail cover

(1) Reattach the right X-rail cover in the reverse order in which it was detached.

7.1.5 How to Replace the Left X-Rail Cover

How to detach the left X-rail cover

(1) Detach the left corner cover and rear left corner cover (see Subsection 7.1.2).

(2) Remove the four M4L12 binding head screws from the left X-rail cover.

(3) Detach the left X-rail cover.

How to reinstall the left X-rail cover

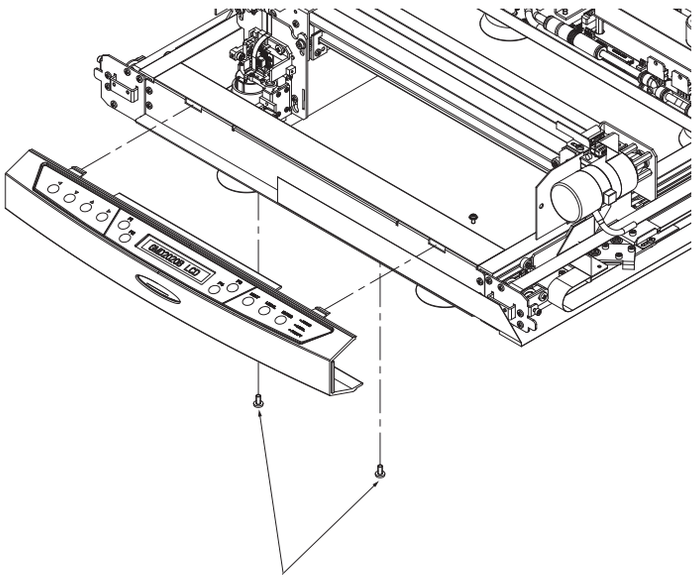
(1) Reattach the right X-rail cover in the reverse order in which it was detached.

7.1.6 How to Replace the Control Panel Cover

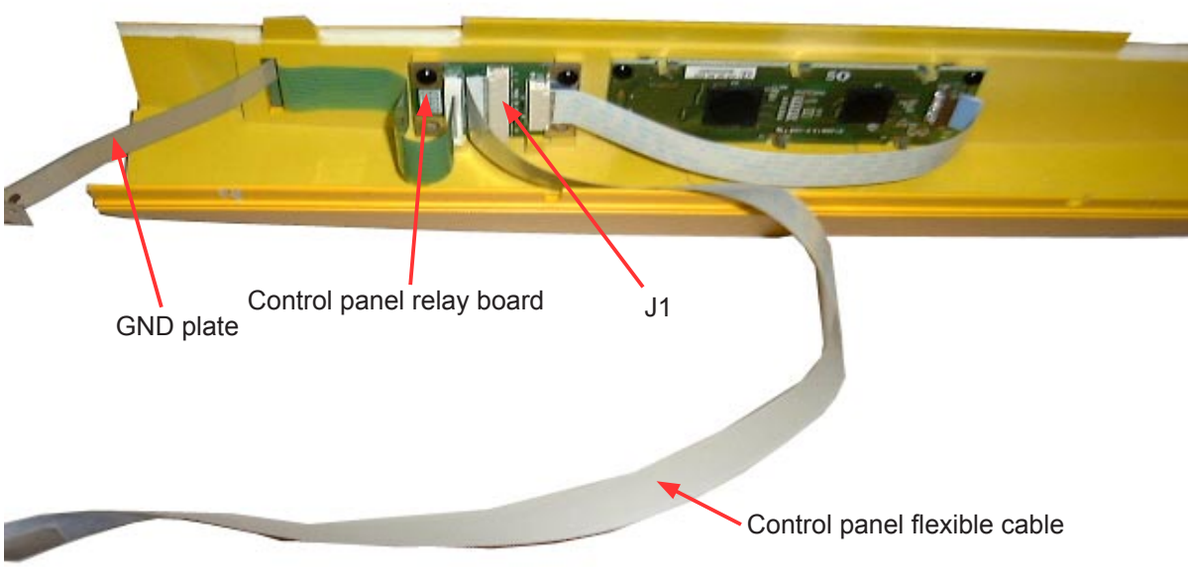
How to detach the control panel cover

(1) Detach the right corner cover and left cover (see Subsection 7.1.2).

(2) Remove the two M4L8 binding head screws from the bottom of the control panel cover.



(3) Disconnect the control panel flexible cable from the control panel relay board J1 connector.



(4) Remove the M3L6 TP head screw attaching the GND plate near the right corner cover.

(5) Detach the control panel cover.

How to reinstall the control panel cover

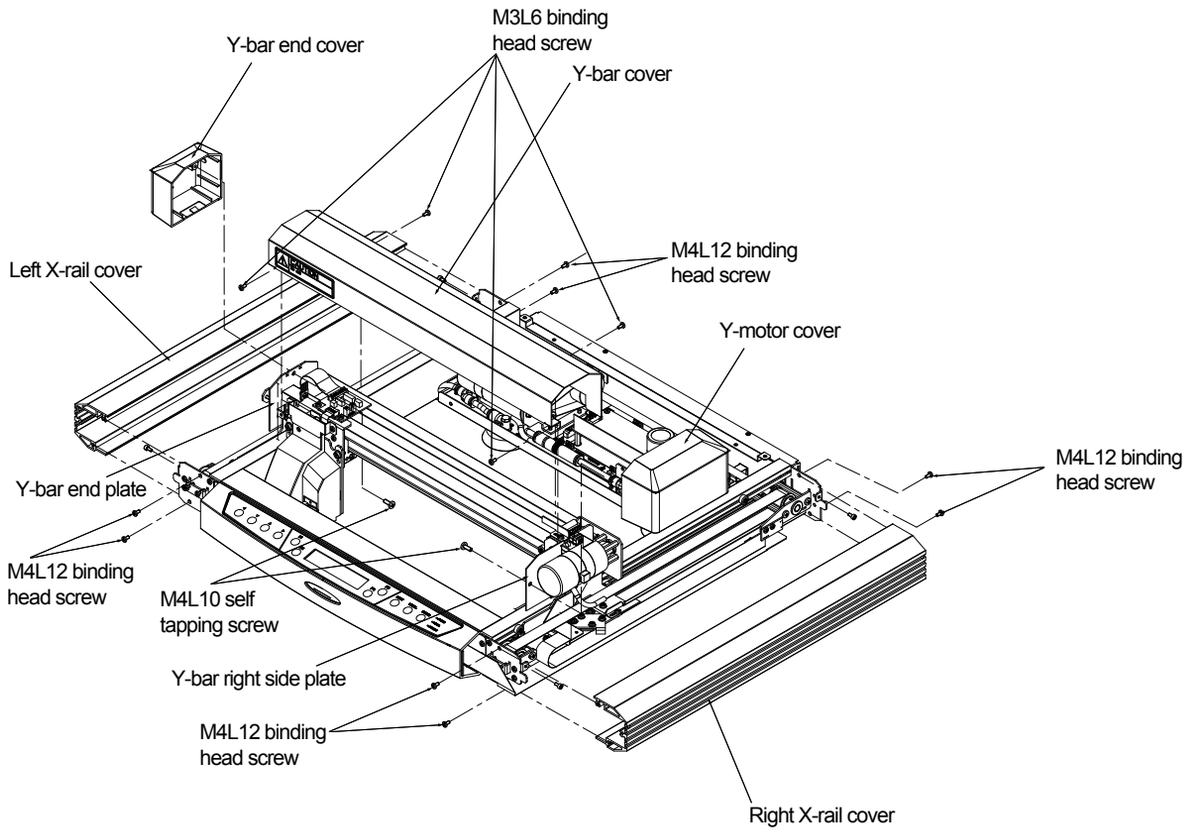
(1) Reattach the control panel cover in the reverse order in which it was detached.

7.1.7 How to Replace the Y-bar Cover

How to detach the Y-bar cover

(1) Remove the four M3L6 binding head screws attaching the Y-bar cover.

(2) Detach the Y-bar cover.



How to install the Y-bar cover

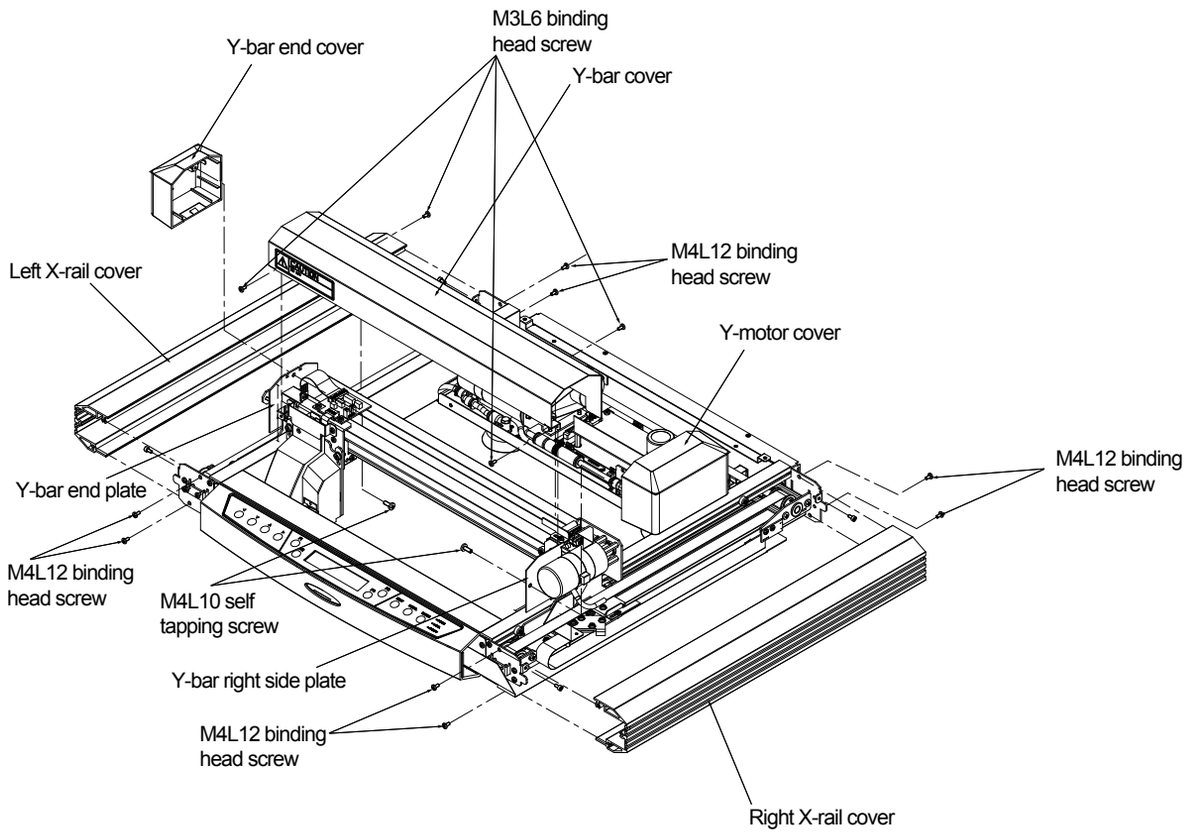
(1) Reattach the Y-bar cover in the reverse order in which it was detached.

7.1.8 How to Replace the Y-motor Cover

(1) Detach the Y-bar cover (see Subsection 7.1.7).

(2) Remove the M4L10 self-tapping screw attaching the Y-motor cover.

(3) Detach the Y-motor cover.



How to install the Y-motor cover

(1) Reattach the Y-motor cover in the reverse order in which it was detached.

⚠ CAUTION

Make sure that the Y-flexible cable does not get caught in the Y-motor cover when attaching the cover.

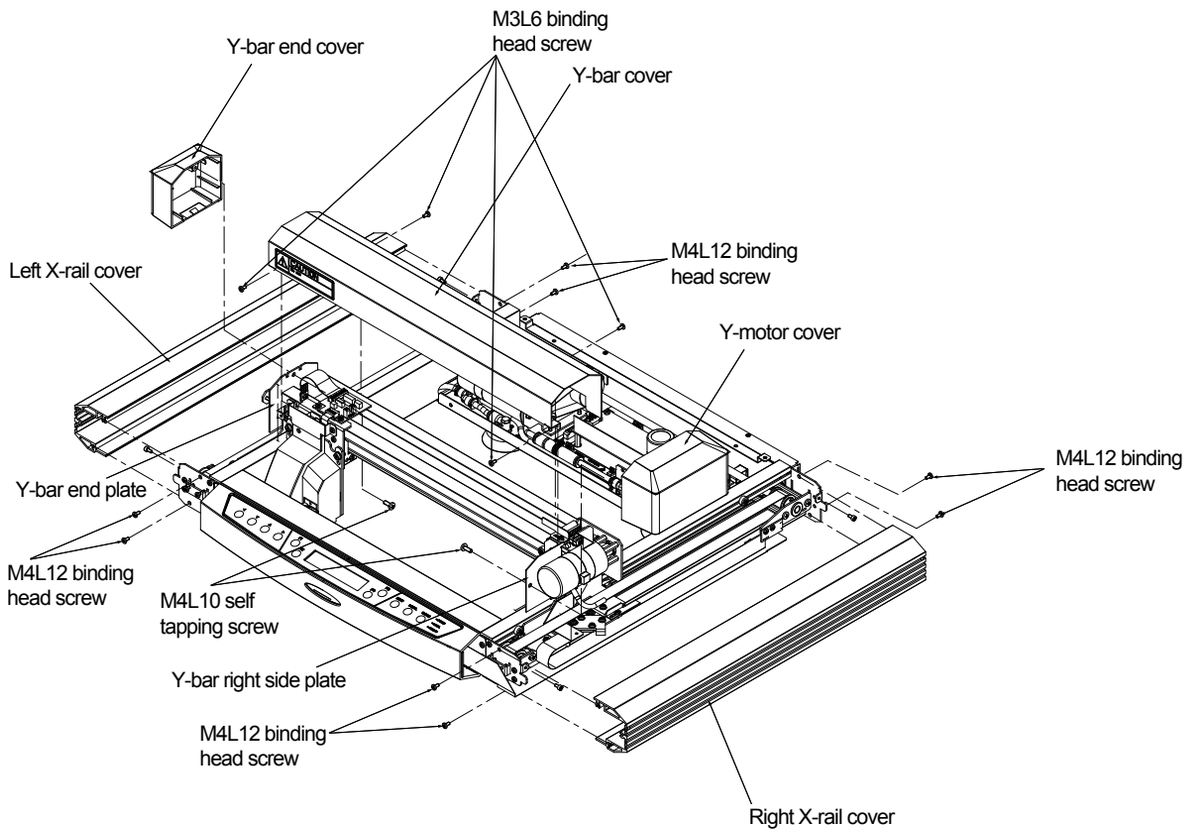
7.1.9 How to Replace the Y-bar End Cover

How to detach the Y-bar end cover

(1) Detach the Y-bar cover (see Subsection 7.1.7).

(2) Remove the M4L10 self-tapping screw attaching the Y-bar end cover.

(3) Detach the Y-bar end cover.



How to install the Y-bar end cover

(1) Reattach the Y-bar end cover in the reverse order in which it was detached.

7.2 Mechanical Parts

7.2.1 How to Replace the Pen Block

How to detach the pen block

(1) Detach the Y-bar cover (see Subsection 7.1.7).

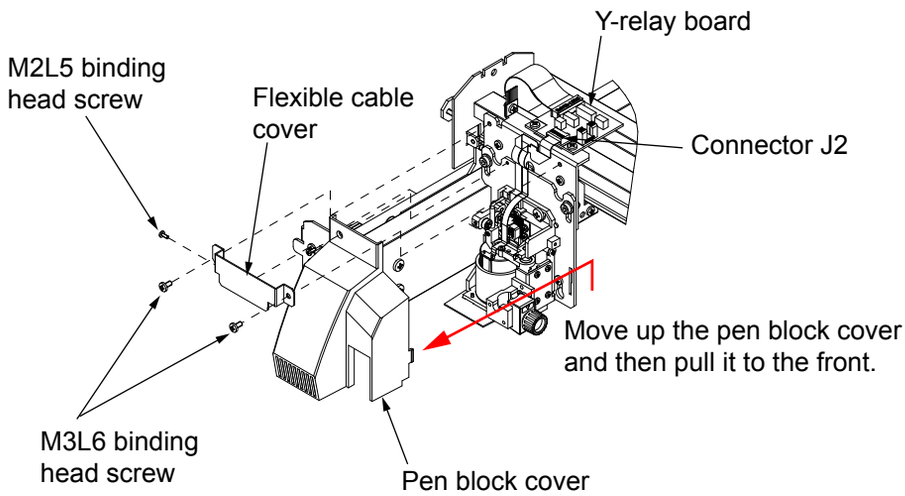
(2) Remove the two M3L6 binding head screws attaching the flexible cable cover.

(3) Remove the flexible cable cover.

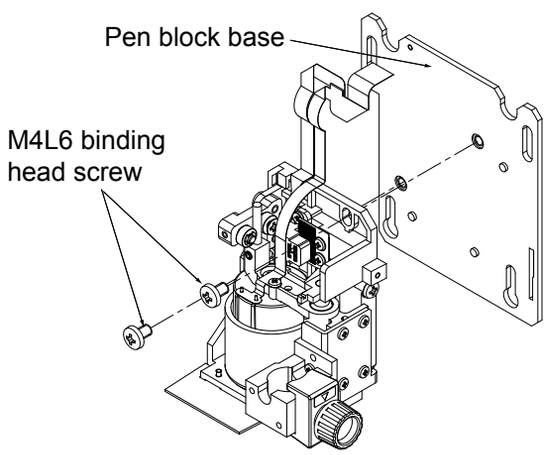
(4) Remove the M2L5 binding head screw attaching the pen block cover.

(5) Remove the pen block cover.

(6) Disconnect the flexible cable from connector J2 on the Y-relay board.


Y-relay board
M2L5 binding head screw
Flexible cable cover
Connector J2
Move up the pen block cover and then pull it to the front.
M3L6 binding head screw
Pen block cover

(7) Remove the two M4L6 binding head screws attaching the pen block.



(8) Detach the pen block from the pen block base.

How to reinstall the pen block

(1) Attach the pen block to the lower position of the pen block base.

(2) Fasten the two M4L6 binding head screws to attach the pen block.

(3) Reattach the other parts in the reverse order in which they were detached.

7.2.2 How to Replace the Y-belt

How to detach the Y-belt

(1) Detach the Y-bar cover (see Subsection 7.1.7).

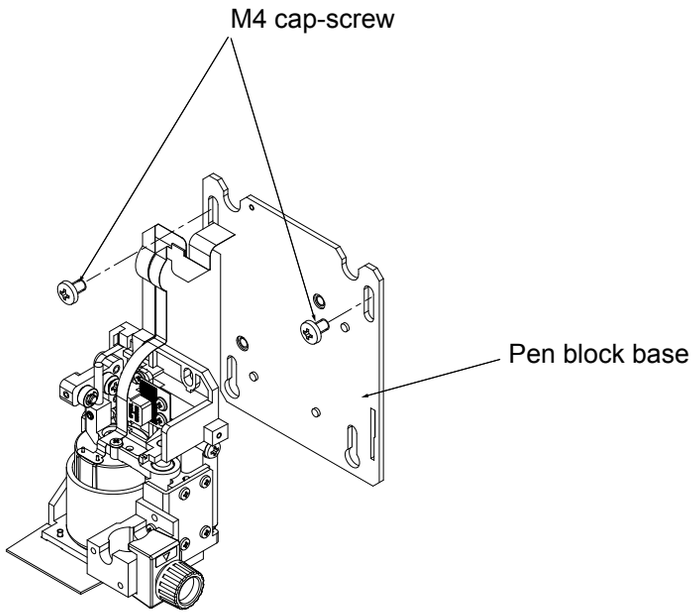
(2) Detach the Y-motor cover (see Subsection 7.1.8).

(3) Detach the Y-end cover (see Subsection 7.1.9).

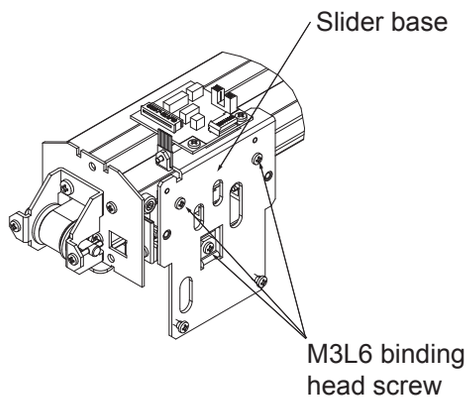
(4) Detach the pen block (see Subsection 7.2.1).

(5) Disconnect the flexible cable from connector J1 on the Y-relay board.

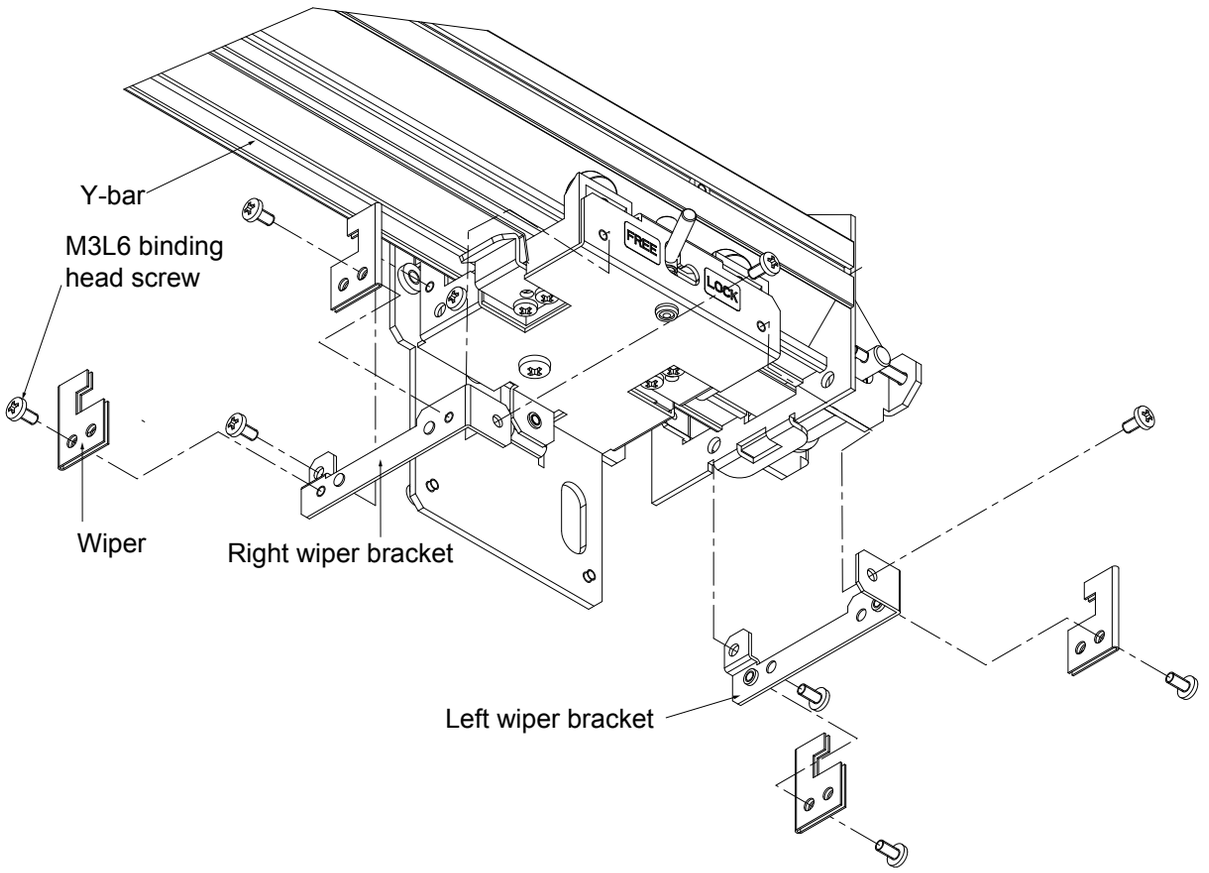
(6) Remove the two M4 cap screws attaching the pen block base.



(7) Remove the three M3L6 binding head screws attaching the slider base.

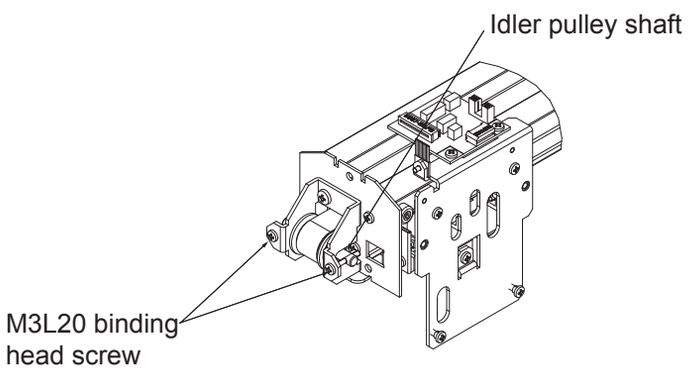


(8) Remove the M3L6 binding head screws attaching the four wiper holders.

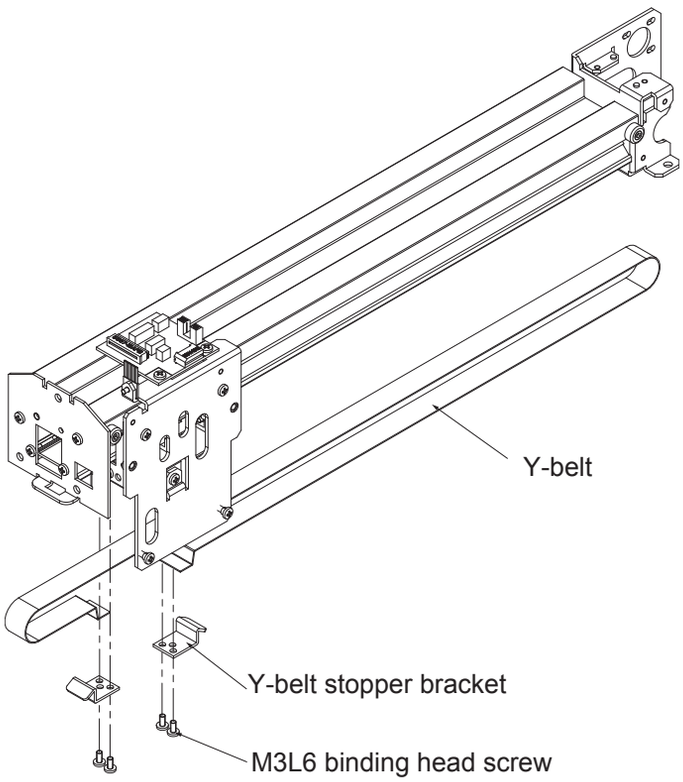


(9) Remove the four M3L6 binding head screws attaching the right wiper bracket and the left wiper bracket.

(10) Loosen the two M3L20 binding head screws attaching the Y-idler pulley shaft.



(11) Remove the four M3L6 binding head screws attaching the two Y-belt stopper brackets to the slider.

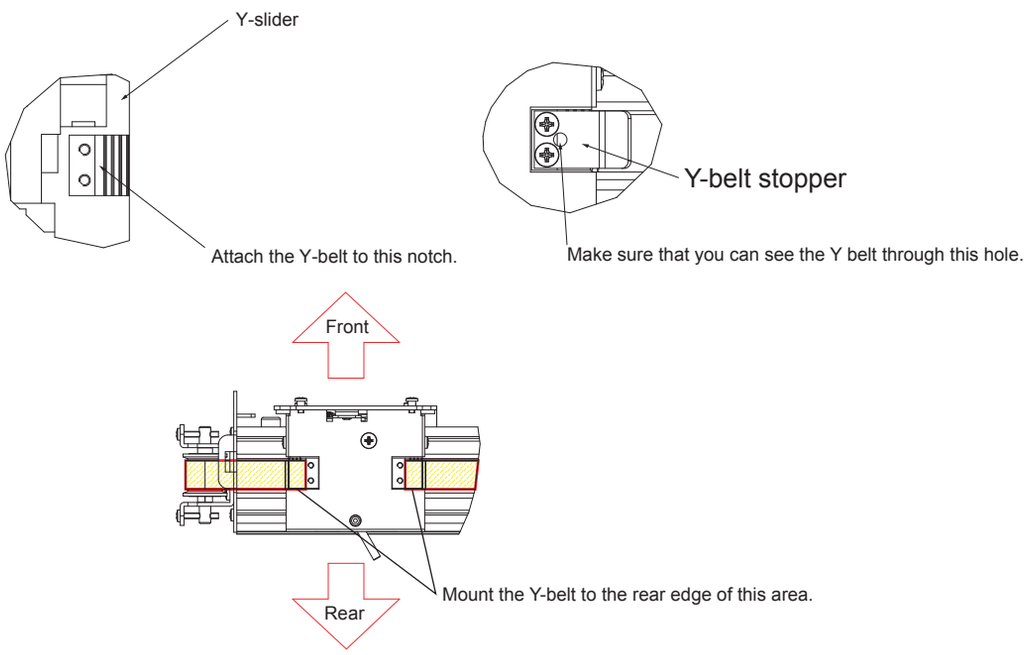


(12) Detach the Y-belt.

How to reinstall the Y-belt

(1) Hang the Y-belt on both sides of the pulley.

(2) Attach both ends of the Y-belt to the Y-slider so that four notches of the Y-belt fit into the Y-slider, then attach with the Y-belt stopper plates.

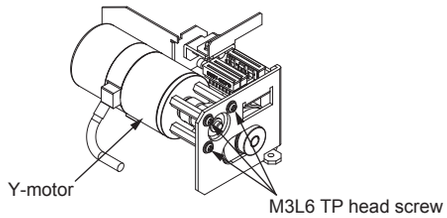

Y-slider
Attach the Y-belt to this notch.
Y-belt stopper
Make sure that you can see the Y belt through this hole.
Front
Rear
Mount the Y-belt to the rear edge of this area.

(3) Perform the Y-belt tension adjustment and Y-motor belt adjustment (see Section 7.2.3).

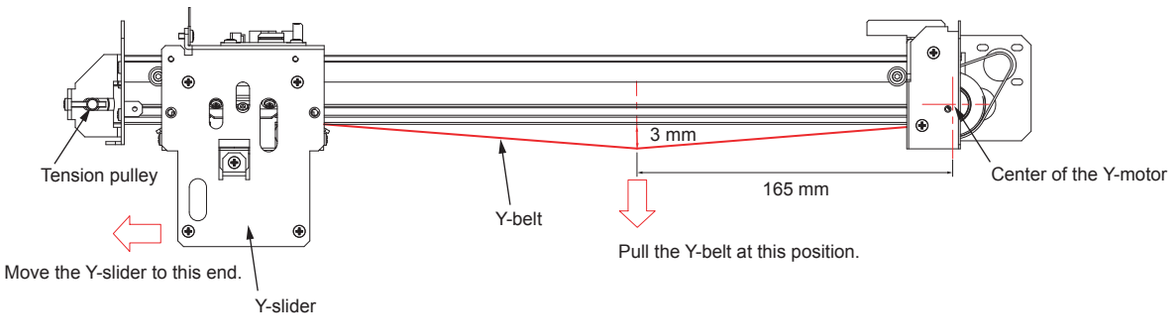
(4) Reattach the other parts in the reverse order in which they were detached.

7.2.3 How to Adjust the Y-belt Tension and Alignment

(1) Loosen the three M3L6 TP head screws attaching the Y-motor about one turn.



(2) Move the Y-slider to the end of the tension pulley side.

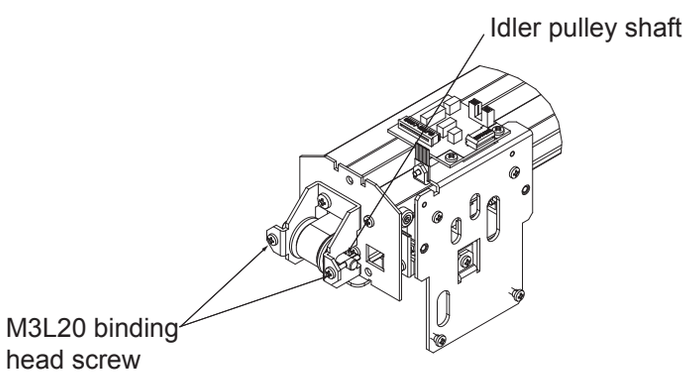


(3) Pull the Y-belt 3 mm from the Y-rail at a distance of approx.165 mm from the Y-motor shaft, using a force gauge with a wire.

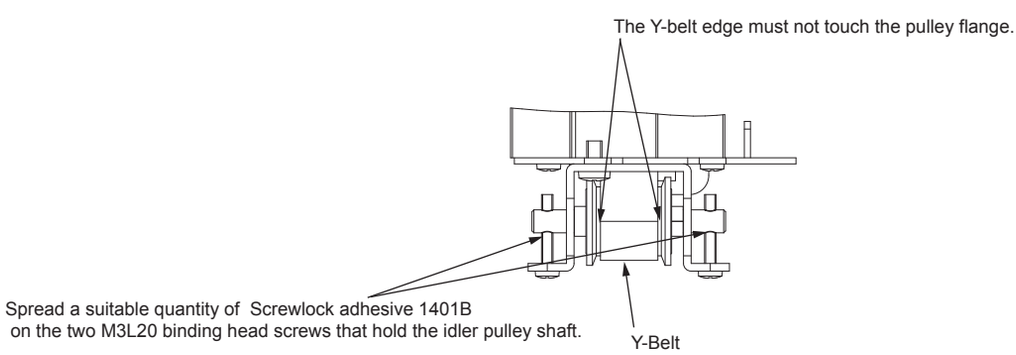
The pull force should be 90 g to 110 g. Adjust the Y-belt tension using the two M3L20 binding head screws.

(4) Move the Y-slider throughout the entire area then make sure the Y-belt edge does not touch the tension pulley flange.

Adjust the two M3L20 binding head screws attaching the idler pulley shaft to align the Y-belt to the idler pulley.

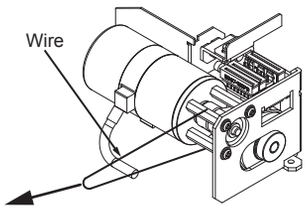


(5) Make sure that there are no strange sounds made when the Y-slider is moving.


The Y-belt edge must not touch the pulley flange.
Spread a suitable quantity of Screwlock adhesive 1401B
on the two M3L20 binding head screws that hold the idler pulley shaft.
Y-Belt

(6) Spread a suitable quantity of Screwlock adhesive 1401B on the two M3L20 binding head screws that hold the idler pulley shaft.

(7) Hang the wire on the Y-motor as shown below.



Use the force gauge to pull
the Y-motor with a 1.3 kg to 1.6 kg force.

(8) Use the force gauge to pull the Y-motor with a 1.4 kg to 1.6 kg force.

(9) Tighten the three M3L6 TP head screws that hold the Y-motor.

7.2.4 How to Replace the Y-motor

How to detach the Y-motor

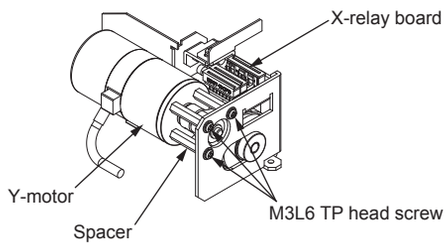
(1) Detach the Y-bar cover (see Subsection 7.1.7).

(2) Detach the Y-motor cover (see Subsection 7.1.8).

(3) Disconnect the flexible cable from connectors J2 to J4 on the X-relay board.

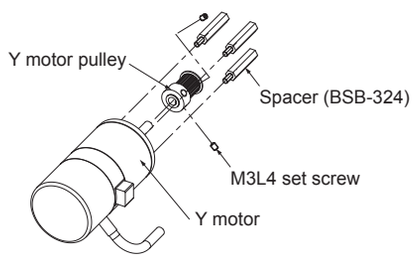
(4) Disconnect the terminal cable from the Y-motor.

(5) Remove the three M3L6 binding head screws attaching the Y-motor.



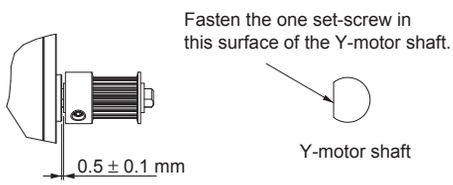
(6) Remove the three spacers attaching the Y-motor.

(7) Remove the two M3L4WP set screws attaching the Y-motor pulley.



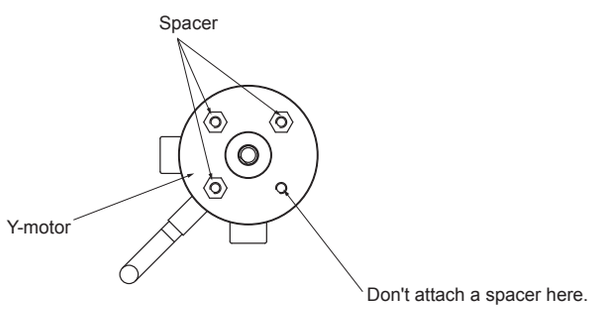
How to reinstall the Y-motor

(1) Attach the Y-motor pulley to the Y-motor as shown below.



(2) Spread a suitable quantity of Loctite 222 on the two M3L4WP set screws that hold the Y-motor pulley.

(3) Attach the three spacers to the Y-motor.



(4) Hang the Y-motor belt on the Y-motor pulley.

(5) Attach the Y-motor to the Y-motor bracket.

(6) Fasten the three M3L6 TP head screws temporarily to attach the Y-motor.

(7) Perform the Y-belt tension adjustment and Y-motor belt adjustment (see Section 7.2.3).

(8) Reattach the other parts in the reverse order in which they were detached.

7.2.5 How to Replace the Y-motor Belt

How to detach the Y-motor belt

(1) Detach the Y-bar cover (see Subsection 7.1.7).

(2) Detach the Y-motor cover (see Subsection 7.1.8).

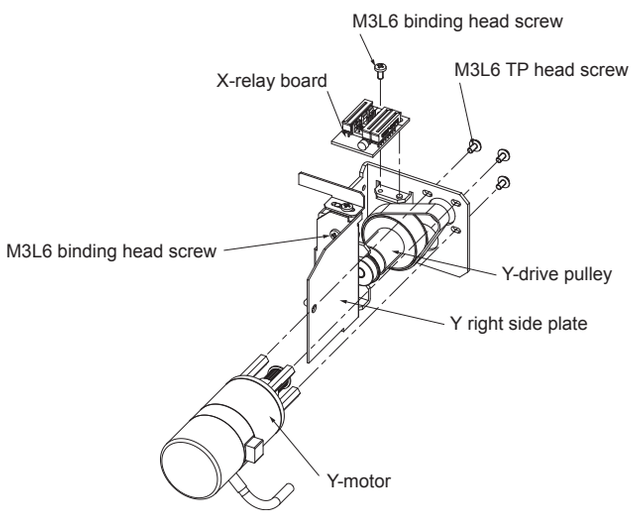
(3) Disconnect the flexible cable from connectors J2 to J4 on the X-relay board.

(4) Detach the Y-belt (see Subsection 7.2.2).

(5) Detach the Y-motor (see Subsection 7.2.4).

(6) Remove the two M3L6 binding head screws attaching the Y-slider plate.

(7) Detach the motor belt from the Y-drive pulley.



How to reinstall the Y-motor belt

(1) Reattach the Y-motor belt in the reverse order in which it was detached.

(2) Perform the Y-belt tension adjustment and Y-motor belt adjustment (see Section 7.2.3).

7.2.6 How to Replace the Y-flexible Cable

How to detach the Y-flexible cable

(1) Detach the Y-bar cover (see Subsection 7.1.7).

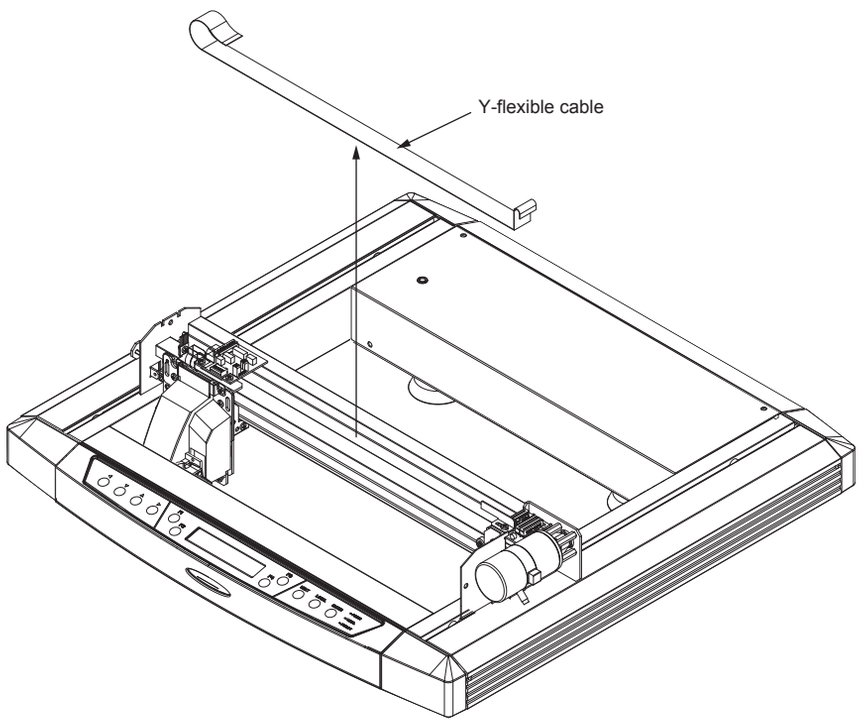
(2) Detach the Y-motor cover (see Subsection 7.1.8).

(3) Detach the Y-bar end cover (see Subsection 7.1.9).

(4) Disconnect the Y-flexible cable from connector J1 on the Y-relay board.

(5) Disconnect the Y-flexible cable from connector J1 on the X-relay board.

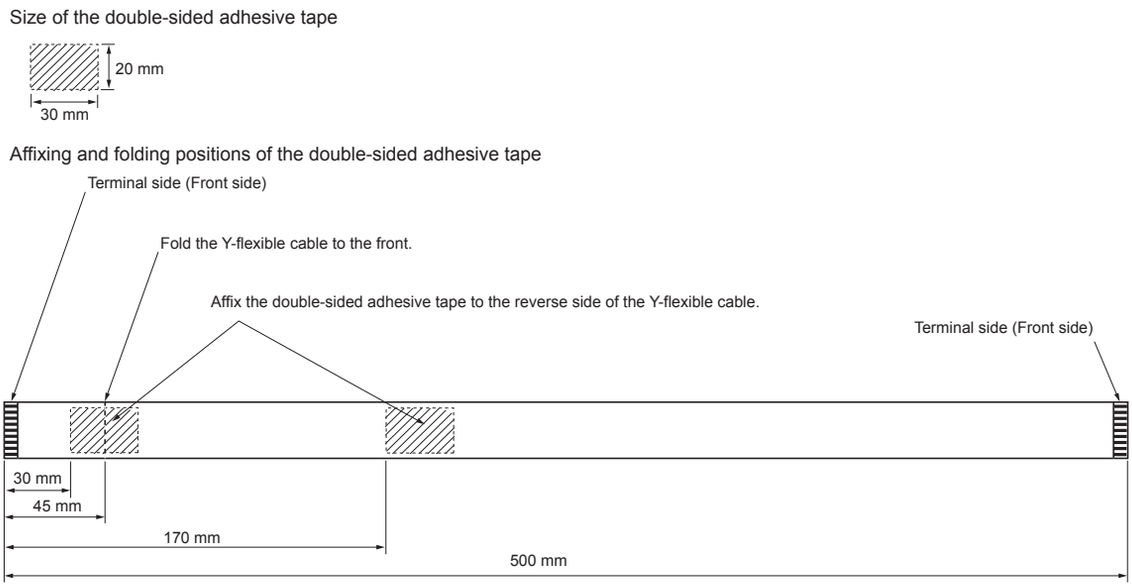
(6) Remove the Y-flexible cable that is attached with double-sided adhesive tape to the Y-rail.



How to reinstall the Y-flexible cable

(1) Clean the surface of the Y-rail with alcohol where the Y-flexible cable was attached.

(2) Affix two pieces of double-sided adhesive tape to the reverse side of the Y-flexible cable (the terminal side is the front side) as shown below.


Size of the double-sided adhesive tape
20 mm
30 mm
Affixing and folding positions of the double-sided adhesive tape
Terminal side (Front side)
Fold the Y-flexible cable to the front.
Affix the double-sided adhesive tape to the reverse side of the Y-flexible cable.
Terminal side (Front side)
30 mm
45 mm
170 mm
500 mm

Size of the double-sided adhesive tape:

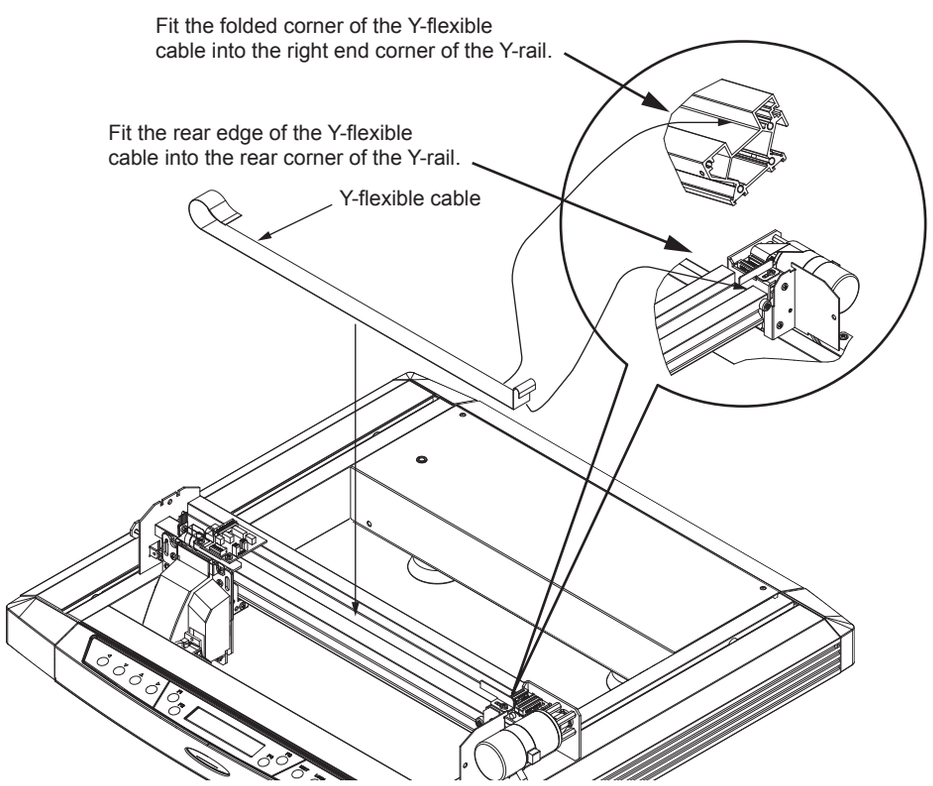
20 mm wide, 30 mm length of tape (Nitto #500)

Position of the first piece of tape : 30 mm from the end of the Y-flexible cable

Position of the second piece of tape : 170 mm from the end of the Y-flexible cable

(3) Fold the Y-flexible cable to the front, 45 mm from the end of the Y-flexible cable.

(4) Fit the Y-flexible cable into the Y-rail as shown below.


Fit the folded corner of the Y-flexible cable into the right end corner of the Y-rail.
Fit the rear edge of the Y-flexible cable into the rear corner of the Y-rail.
Y-flexible cable

(5) Secure the Y-flexible cable onto the flexible cable guide of the Y-rail using double-sided adhesive tape.

(6) Connect the Y-flexible cable to connector J1 on the Y-relay board.

(7) Connect the Y-flexible cable to connector J1 on the X-relay board.

(8) Reattach the other parts in the reverse order in which they were detached.

7.2.7 How to Replace the X-belt

How to detach the X-belt

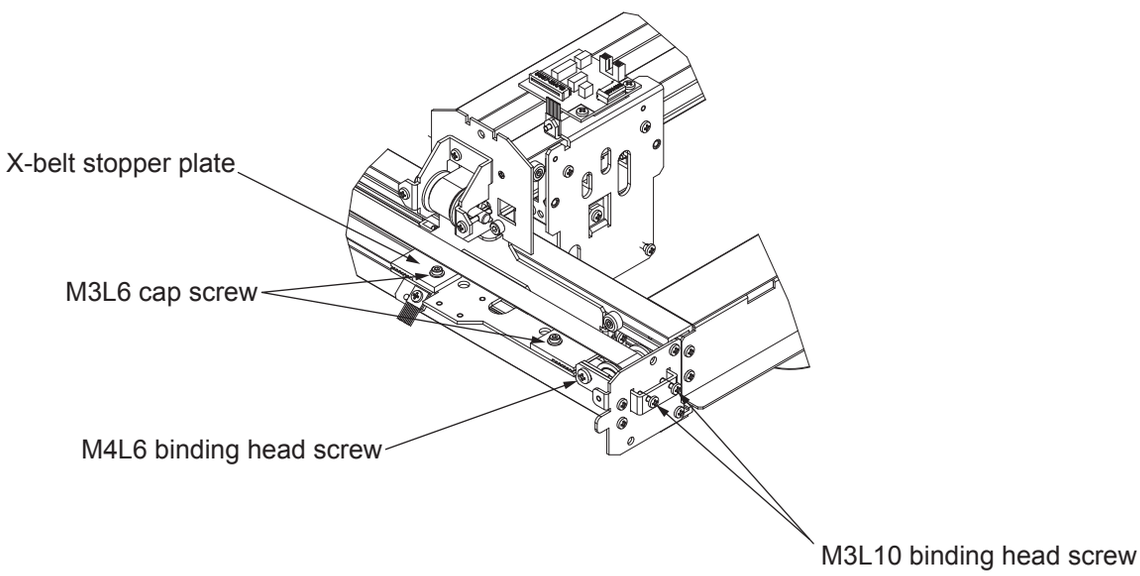
(1) Detach the corner covers (see Subsection 7.1.2).

(2) Detach the Y-motor cover (see Subsection 7.1.8).

(3) Detach the Y-end cover (see Subsection 7.1.9).

(4) Detach the X-rail covers (see Subsection 7.1.4, Subsection 7.1.5).

(5) Loosen the M4L6 binding head screw attaching the X-tension bracket about one turn.



(6) Loosen the two M3L10 binding head screws adjusting the X-belt tension and alignment.

(7) Remove the two M3L6 cap screws attaching the X-belt stopper plate.

(8) Detach the X-belt.

How to reinstall the X-belt

(1) Attach the X-belt to the X-slider so that all the notches of the X-belt stopper are aligned with the X-belt notches.

(2) Reattach the X-belt in the reverse order in which it was detached.

(3) Perform the X-belt tension adjustment and alignment (see Section 7.2.8).

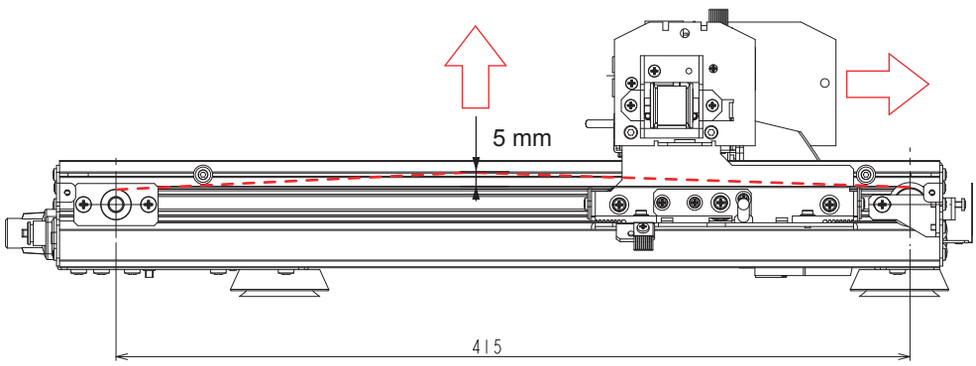
(4) Reattach the other parts in the reverse order in which they were detached.

7.2.8 How to Adjust the X-belt Tension and Alignment

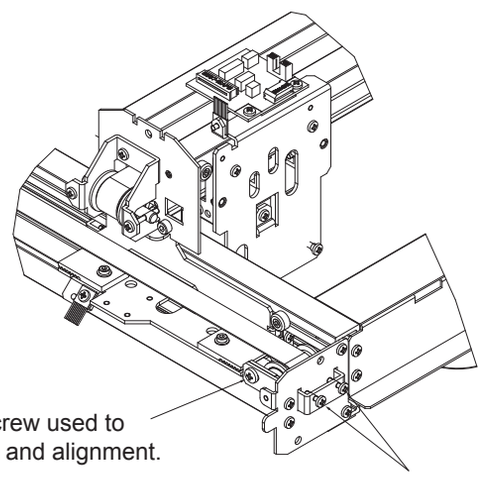
(1) Loosen the M3L6 binding head screws attaching the X-tension bracket about one turn.

(2) Move the Y-bar to the end of the control panel side.

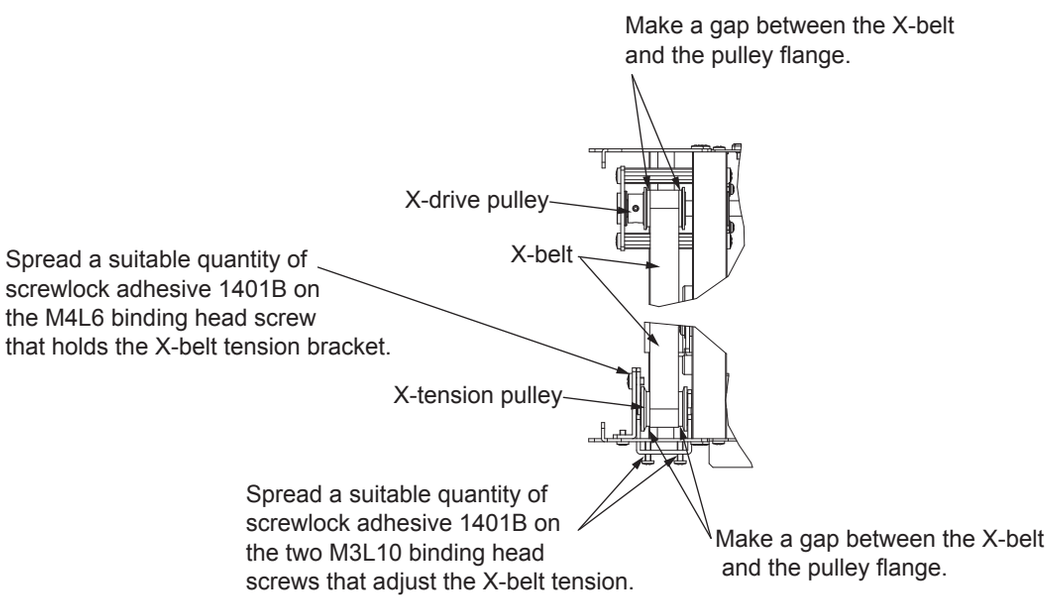
(3) Pull the X-belt 5 mm from the X-rail in the center of the X-belt using a force gauge with a wire. The pull force should be 90 g to 110 g.



(4) Adjust the belt tension and alignment using the two M3L10 binding head screws.


M4L6 binding screw used to lock belt tension and alignment.
Two M3L10 binding screws used for belt tension and alignment.

(5) Move the Y-bar though the entire area and make sure that the X-belt edge does not touch the X pulley flange on the X-drive pulley. Adjust the two M3L10 binding head screws attaching the X-idler pulley shaft to align the X-belt to the X-idler pulley.


Make a gap between the X-belt and the pulley flange.
X-drive pulley
X-belt
Spread a suitable quantity of screwlock adhesive 1401B on the M4L6 binding head screw that holds the X-belt tension bracket.
X-tension pulley
Spread a suitable quantity of screwlock adhesive 1401B on the two M3L10 binding head screws that adjust the X-belt tension.
Make a gap between the X-belt and the pulley flange.

(5) Tighten the M4L6 binding head screw that holds the X-belt tension bracket.

(6) Confirm the right angle by performing the distance adjustment operation (see Section 8.7).

(7) Spread a suitable quantity of screwlock adhesive 1401B on the two M3L10 binding head screws and the M4L6 binding head screw that hold the X-tension bracket.

(8) Reattach the other parts in the reverse order in which they were detached.

7.2.9 How to Replace the X-motor

How to detach the X-motor

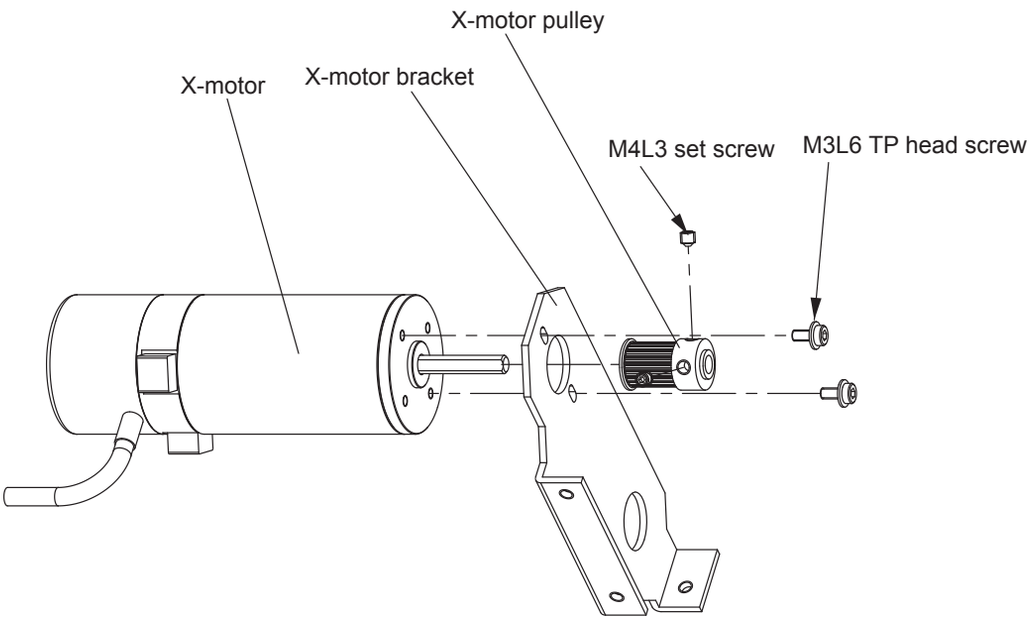
(1) Detach the top cover (see Subsection 7.1.1).

(2) Disconnect the X-motor cables from connector J4 on the main board.

(3) Disconnect the terminal cable from the X-motor.

(4) Loosen the two M4L3 set screws holding the X-motor pulley.

(5) Remove the two M3L6 TP head screws attaching the X-motor.

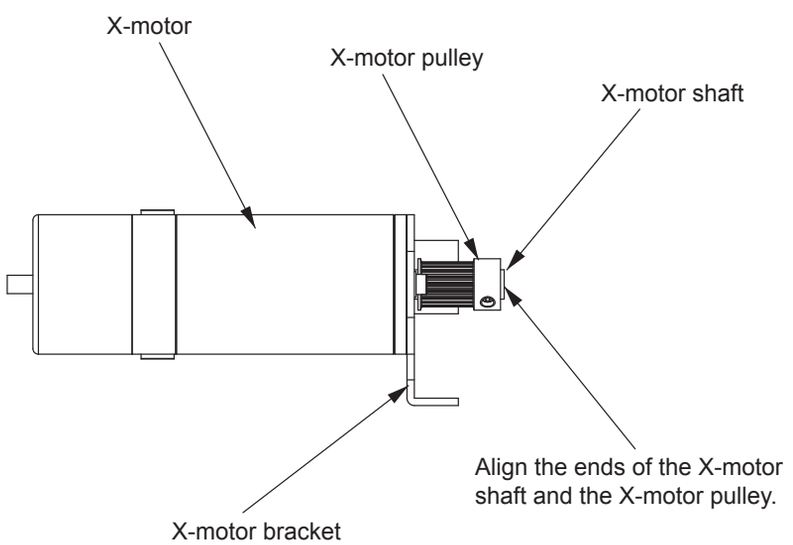


(6) Detach the X-motor.

How to reinstall the X-motor

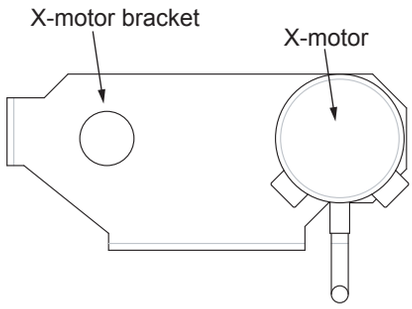
(1) Hang the X-belt on the X-motor pulley and then insert the X-motor shaft into the X-motor pulley.

(2) Align the ends of the X-motor shaft and the X-motor pulley when inserting them.



(3) Spread a suitable quantity of Loctite 222 on the two M3L4WP set screws that hold the X-motor pulley.

(4) Attach the X-motor to the X-motor bracket.



Mounting direction between the X-motor and X-motor bracket

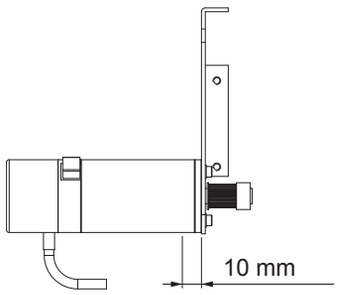
(5) Perform the X-motor belt tension adjustment (see Section 7.2.10).

(6) Reattach the other parts in the reverse order in which they were detached.

7.2.10 How to Adjust the X-motor Belt Tension

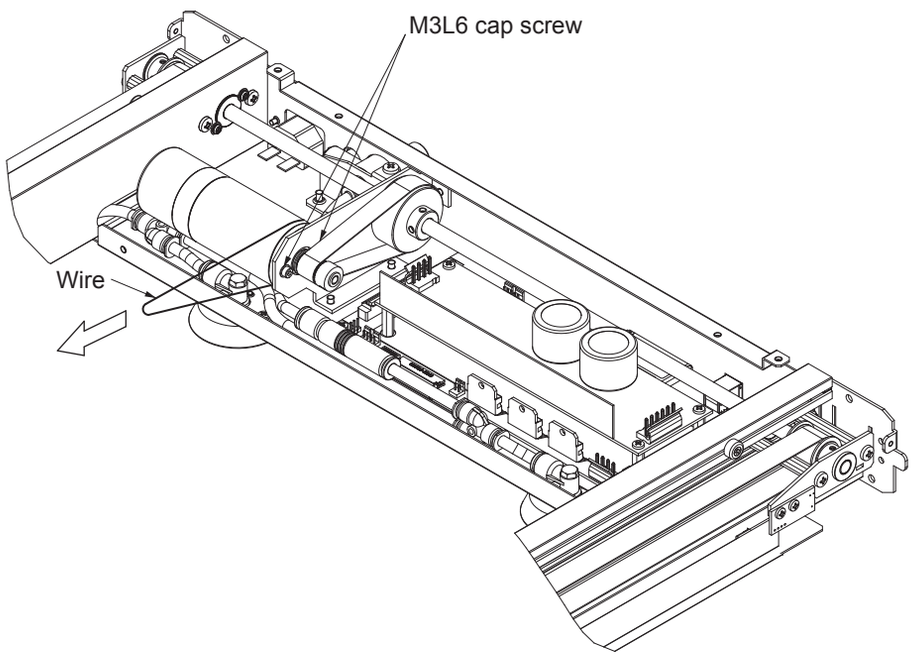
(1) Loosen the two M3L6 cap screws attaching the X-motor about one turn.

(2) Hang the wire on the X-motor within 10 mm from the X-motor edge.



Hang the wire in this area.

(3) Use the force gauge to pull the X-motor with a 1.4 kg to 1.6 kg force.



(4) Tighten the two M3L6 cap screws that hold the X-motor.

(5) Spread a suitable quantity of screwlock adhesive 1401B on the two M3L6 cap screws that hold the X-motor.

7.2.11 How to Replace the Control Panel Flexible Cable (FPC08244)

How to detach the control panel flexible cable

(1) Detach the top cover (see Subsection 7.1.1).

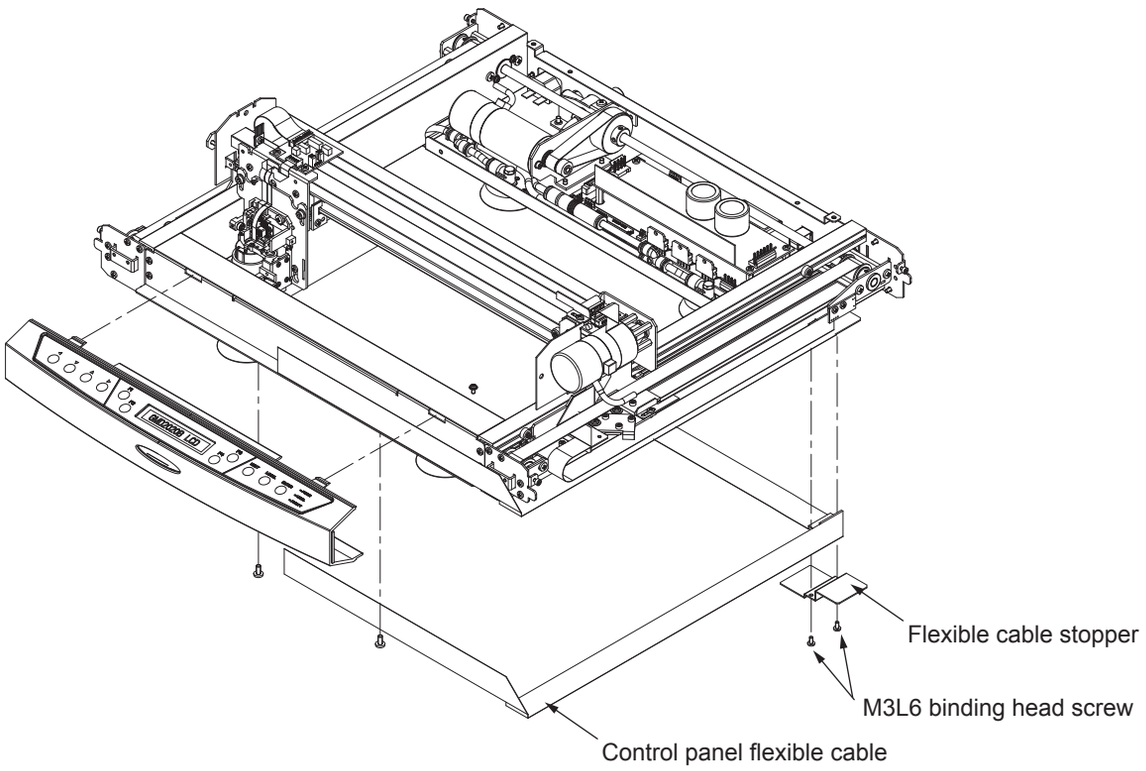
(2) Detach the right corner cover and rear right corner cover (see Subsection 7.1.2).

(3) Detach the right X-rail cover (see Subsection 7.1.4).

(4) Detach the power supply unit (see Subsection 7.3.1).

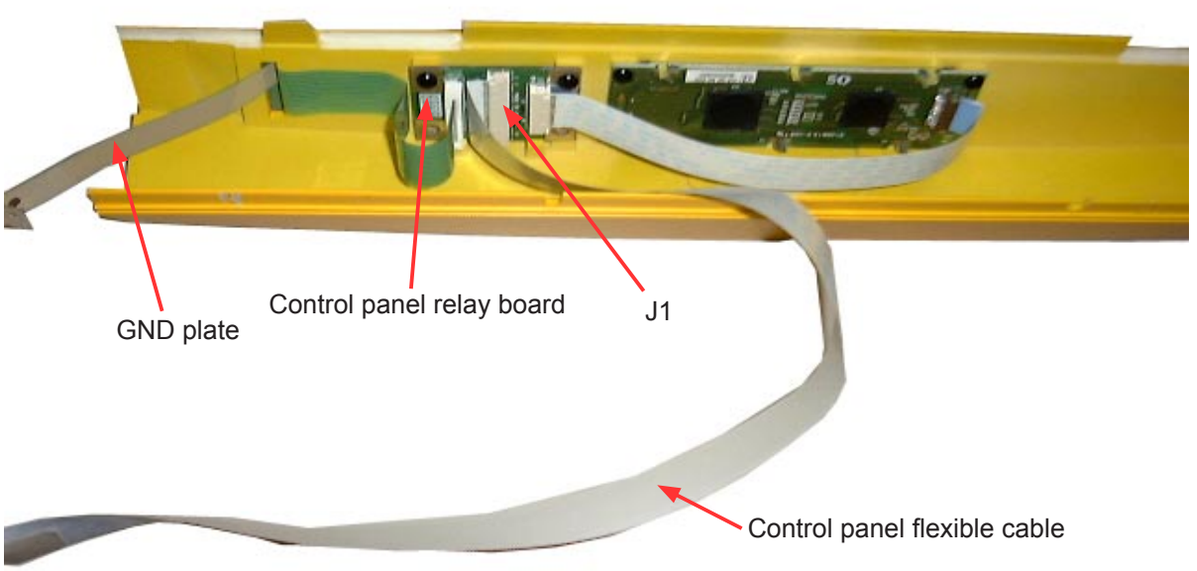
(5) Detach the main board (see Subsection 7.3.2).

(6) Remove the two M3L6 binding head screws attaching the flexible cable stopper.



(7) Detach the control panel cover (see Subsection 7.1.6).

(8) Disconnect the control panel flexible cable from connector J1 on the control panel relay board.



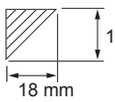
How to reinstall the control panel flexible cable

(1) Prepare five isosceles triangle-shaped pieces of double-sided adhesive tape and one rectangular piece of double-sided adhesive tape as shown below.

Prepare one rectangular piece of Teflon tape as shown below.

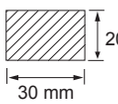
Size of the tapes

Prepare five isosceles triangle-shaped pieces of double-sided adhesive tape.



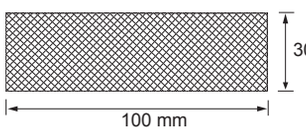
18 x 18 mm triangle shape double-sided adhesive tape

Prepare one rectangular piece of double-sided adhesive tape.



30 x 20 mm double-sided adhesive tape

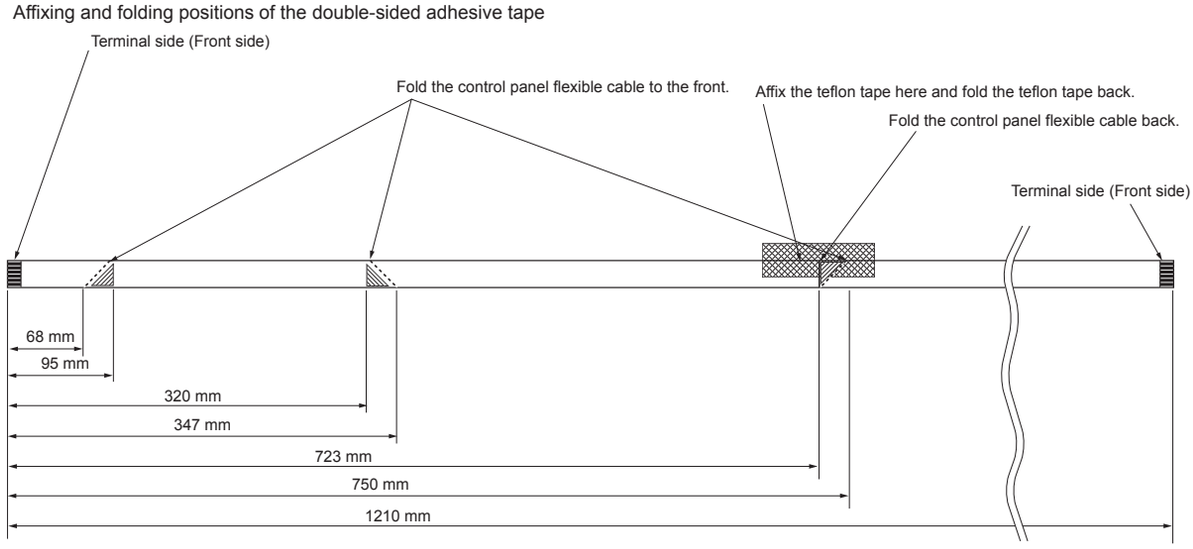
Prepare one rectangular piece of teflon tape.



30 (W) x 100 (L) x 0.18 (t) mm teflon tape

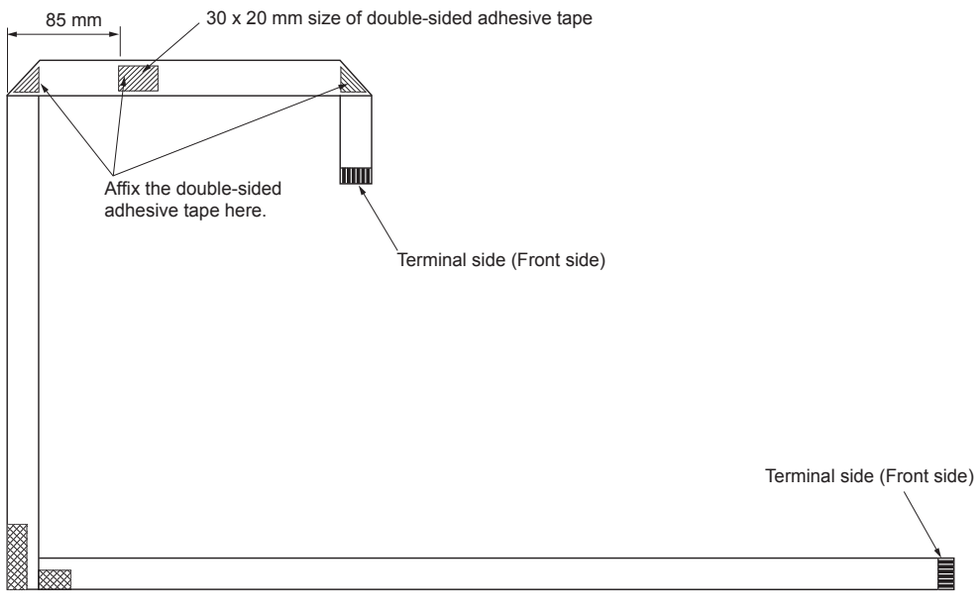
(2) Affix pieces of double-sided adhesive tape to the control panel flexible cable and then fold it as shown below.

Affixing and folding positions of the double-sided adhesive tape

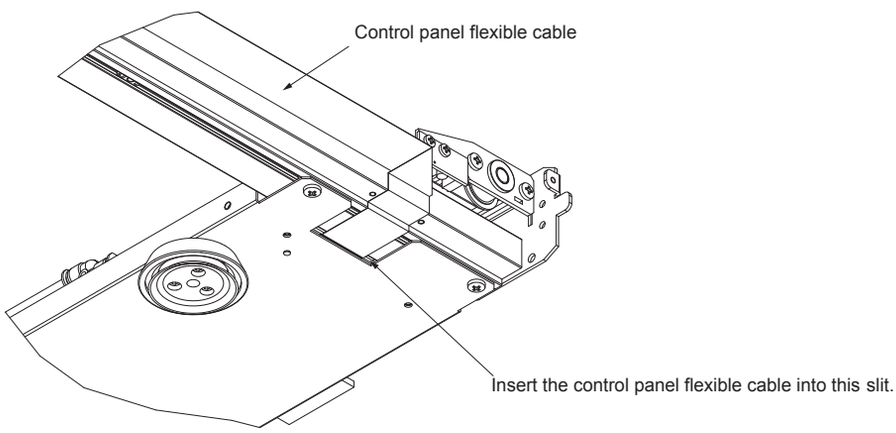

Terminal side (Front side)
Fold the control panel flexible cable to the front.
Affix the teflon tape here and fold the teflon tape back.
Fold the control panel flexible cable back.
Terminal side (Front side)
68 mm
95 mm
320 mm
347 mm
723 mm
750 mm
1210 mm

(3) Affix pieces of double-sided adhesive tape after folding the control panel flexible cable as shown below.

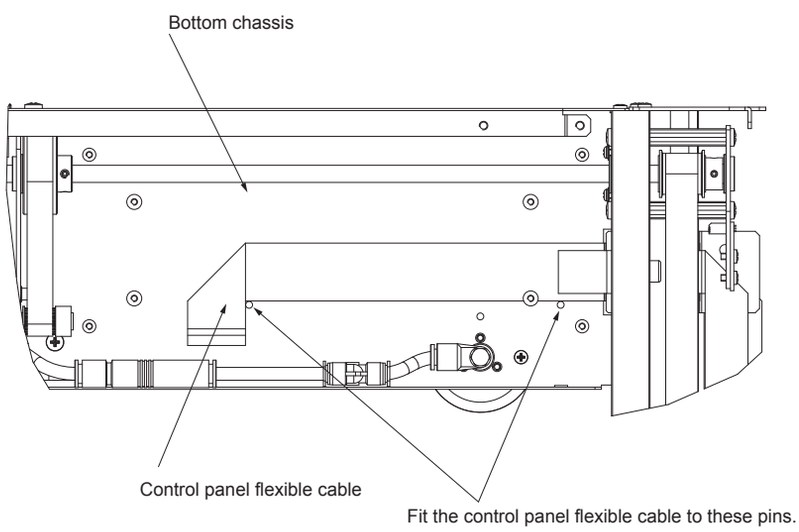
Affixing position of the double-sided adhesive tape after folding the flexible cable


85 mm
30 x 20 mm size of double-sided adhesive tape
Affix the double-sided adhesive tape here.
Terminal side (Front side)
Terminal side (Front side)

(4) Insert the control panel flexible cable from the bottom chassis as shown below.



(5) Fit the control panel flexible cable edge to the half punched pins and then affix the control panel flexible cable to the bottom chassis as shown below.



(6) Reattach the other parts in the reverse order in which they were detached.

7.2.12 How to Replace the X-flexible Cables

How to detach the X-flexible cable

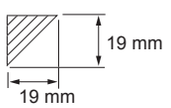
(1) Detach the top cover (see Subsection 7.1.1).
(2) Detach the right corner cover and rear right corner cover (see Subsection 7.1.2).
(3) Detach the right X-rail cover (see Subsection 7.1.4).
(4) Detach the motor cover (see Subsection 7.1.8).
(5) Detach the Y-bar cover (see Subsection 7.1.7).
(6) Disconnect the cable from connectors J2 and J3 on the X-relay board.
(7) Disconnect the flexible cable from connectors J4 and J5 on the X-relay board.
(8) Remove the two M3L6 binding head screws attaching the flexible cable stopper (see Subsection 7.2.11).
(9) Disconnect the flexible cable from connectors J6 and J7 on the main board.

How to reinstall the X-flexible cables

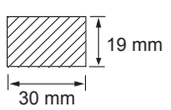
(1) Prepare twenty-one isosceles triangle-shaped pieces of double-sided adhesive tape and one rectangular piece of double-sided adhesive tape as shown below.

Size of the double-sided adhesive tape

Prepare twenty-one isosceles triangle-shaped pieces of double-sided adhesive tape.

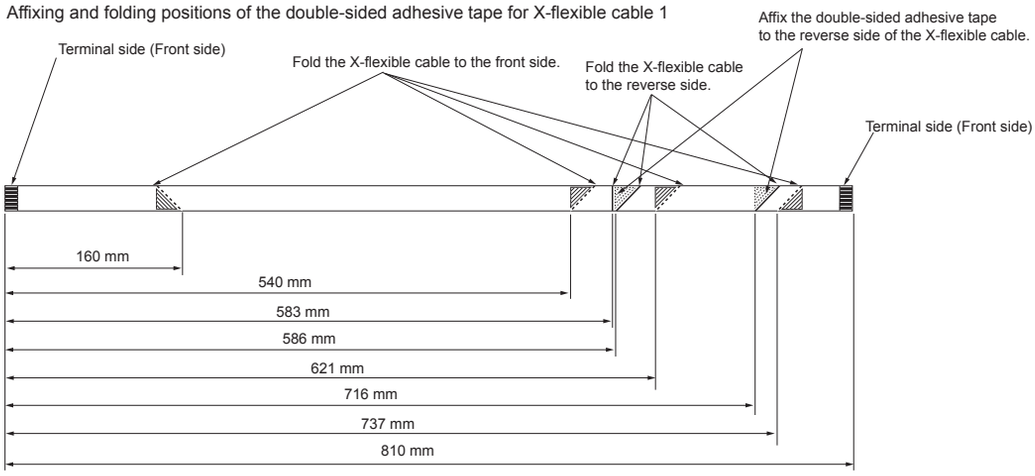


Prepare one rectangular piece of double-sided adhesive tape.

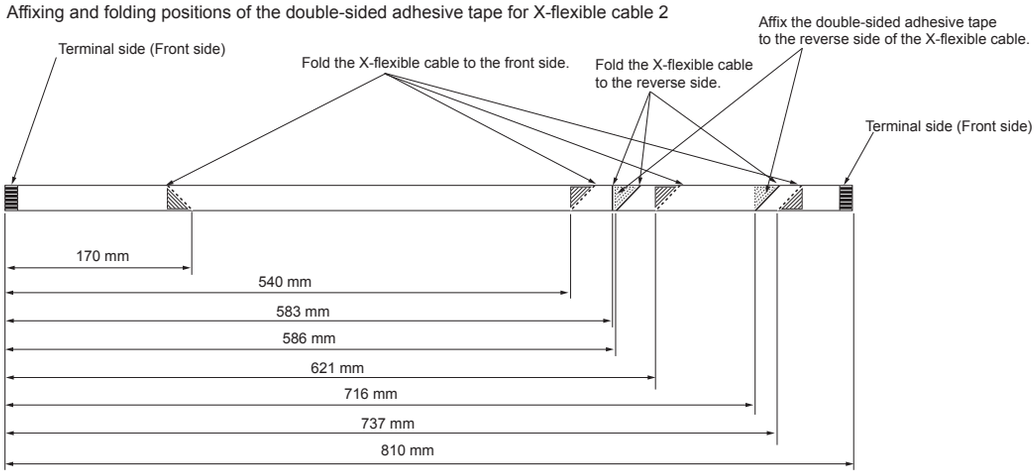


(2) Affix pieces of double-sided adhesive tape to X-flexible cable 1 and X-flexible cable 2 and then fold those flexible cables as shown below.

Affixing and folding positions of the double-sided adhesive tape for X-flexible cable 1

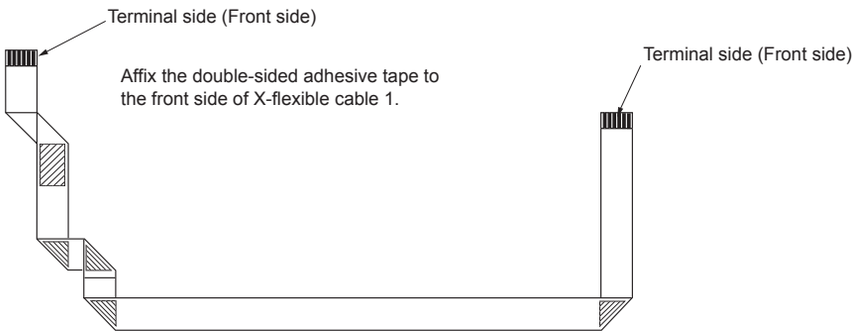

Terminal side (Front side)
Fold the X-flexible cable to the front side.
Fold the X-flexible cable to the reverse side.
Affix the double-sided adhesive tape to the reverse side of the X-flexible cable.
Terminal side (Front side)
160 mm
540 mm
583 mm
586 mm
621 mm
716 mm
737 mm
810 mm

Affixing and folding positions of the double-sided adhesive tape for X-flexible cable 2

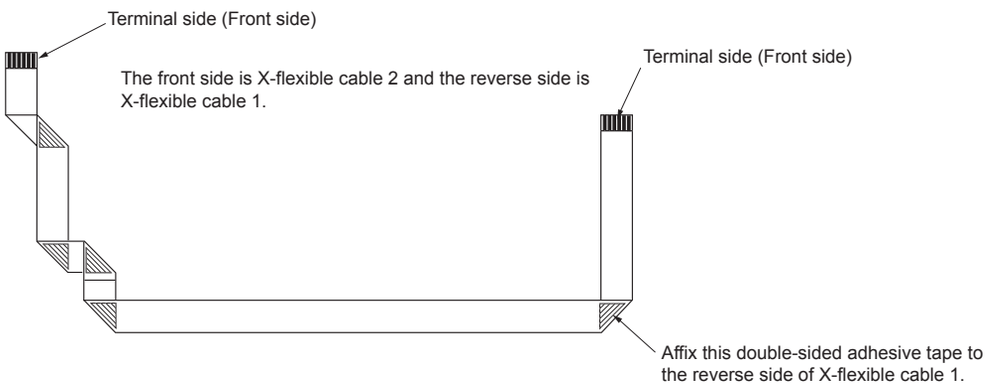

Terminal side (Front side)
Fold the X-flexible cable to the front side.
Fold the X-flexible cable to the reverse side.
Affix the double-sided adhesive tape to the reverse side of the X-flexible cable.
Terminal side (Front side)
170 mm
540 mm
583 mm
586 mm
621 mm
716 mm
737 mm
810 mm

(3) Affix pieces of double-sided adhesive tape after folding the X-flexible cables as shown below.
Affix X-flexible cable 2 to X-flexible cable 1 after affixing the double-sided adhesive tapes to X-flexible cable 1. Next, affix pieces of double-sided adhesive tape to X-flexible cable 2.

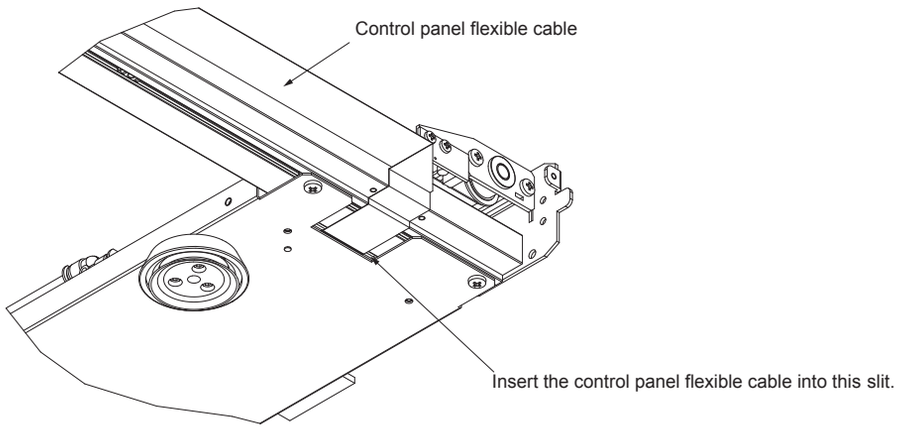
Affixing positions of the double-sided adhesive tape for X-flexible cable 1


Terminal side (Front side)
Affix the double-sided adhesive tape to the front side of X-flexible cable 1.
Terminal side (Front side)

Affixing positions of the double-sided adhesive tape after attaching X-flexible cable 2 to X-flexible cable 1


Terminal side (Front side)
The front side is X-flexible cable 2 and the reverse side is X-flexible cable 1.
Terminal side (Front side)
Affix this double-sided adhesive tape to the reverse side of X-flexible cable 1.

(4) Insert the X-flexible cable from the bottom chassis as shown below.



(5) Reattach the other parts in the reverse order in which they were detached.

7.2.13 How to Confirm the Engraving Area and Adjust the Area

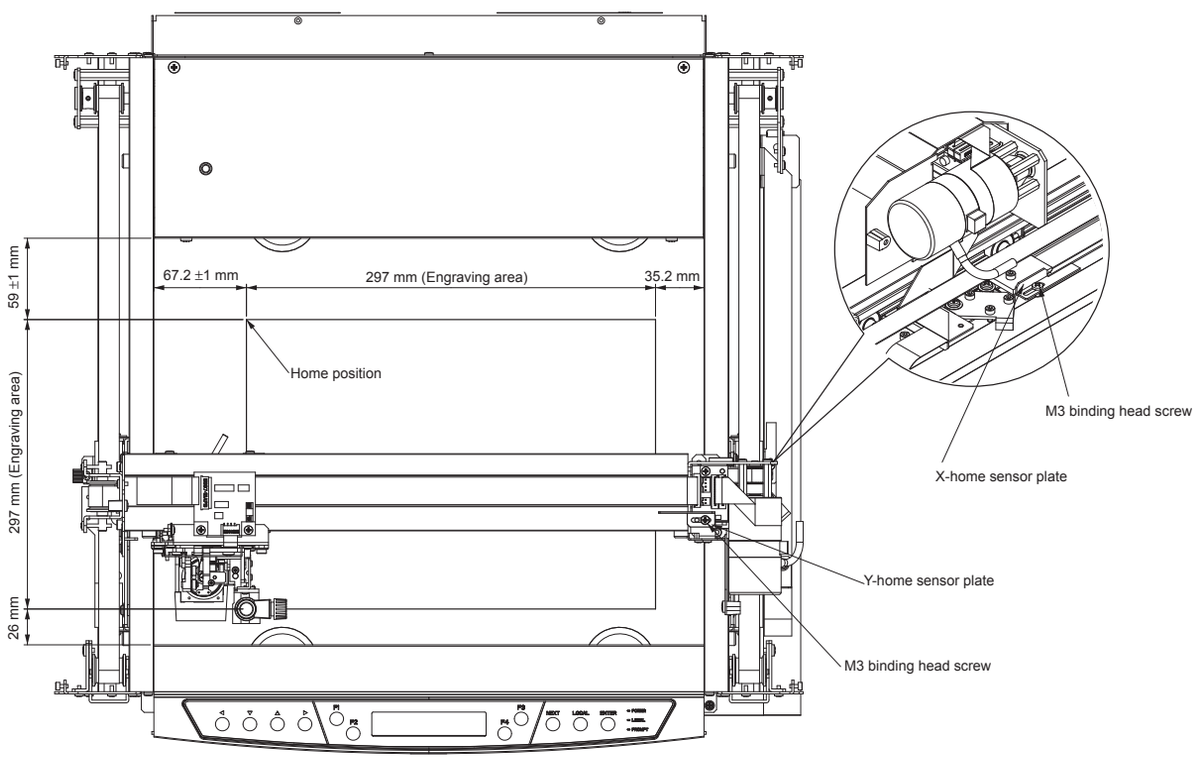
This engraver has a 210 mm x 297 mm engraving area.

How to confirm the engraving area

(1) Load an A3 size aheet of paper in the engraver and mount a ceramic pen in the holder.

(2) Send a 210 mm x 297 mm rectangular plot data file to the engraver and then confirm the plotted size.

(3) If the engraver is not able to plot a 210 mm x 297 mm rectangle, adjust the X-home sensor plate position or Y-home sensor plate position.



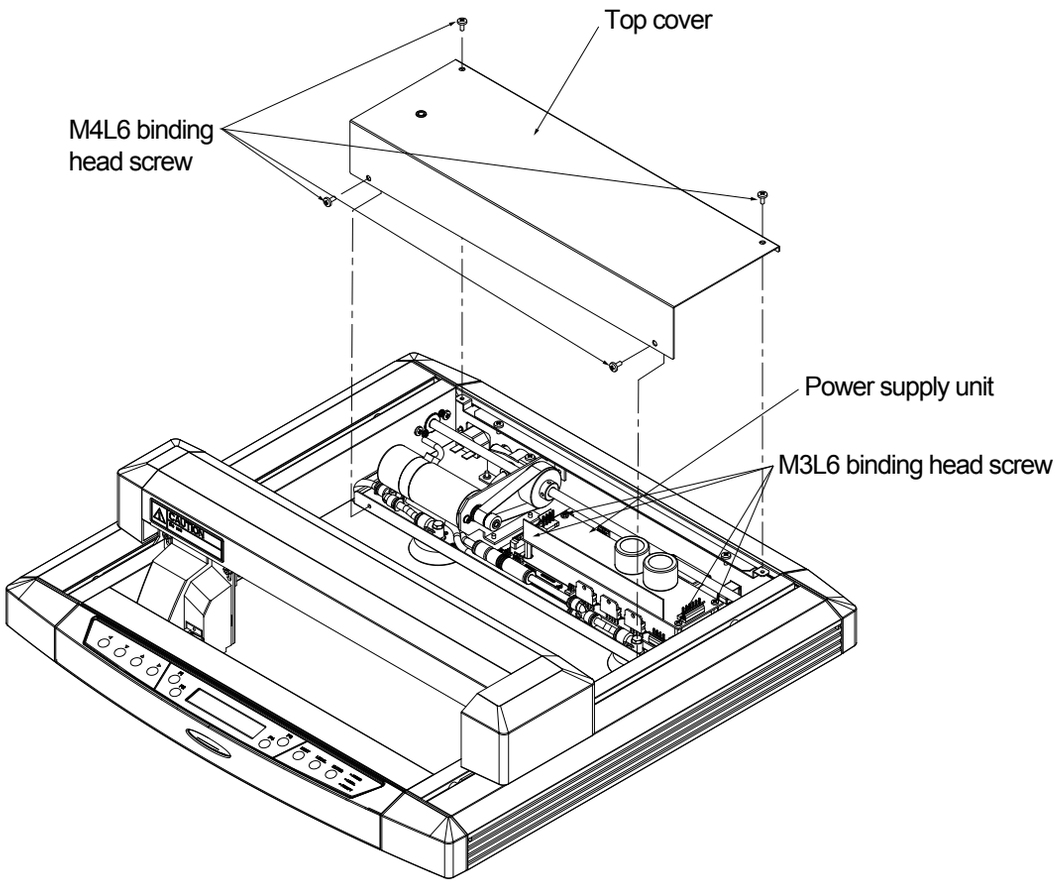
7.3 Electrical Parts

7.3.1 How to Replace the Power Supply Unit

How to detach the power supply unit

(1) Detach the top cover (see Subsection 7.1.1).

(2) Disconnect the cables from connectors CN1 and CN2 on the power supply unit.



(3) Remove the four M3L6 binding head screws attaching the power supply unit.

(4) Detach the power supply unit.

How to reinstall the power supply unit

(1) Reattach the power supply unit in the reverse order in which it was detached.

7.3.2 How to Replace the Main Board

How to detach the main board

(1) Detach the top cover (see Subsection 7.1.1).

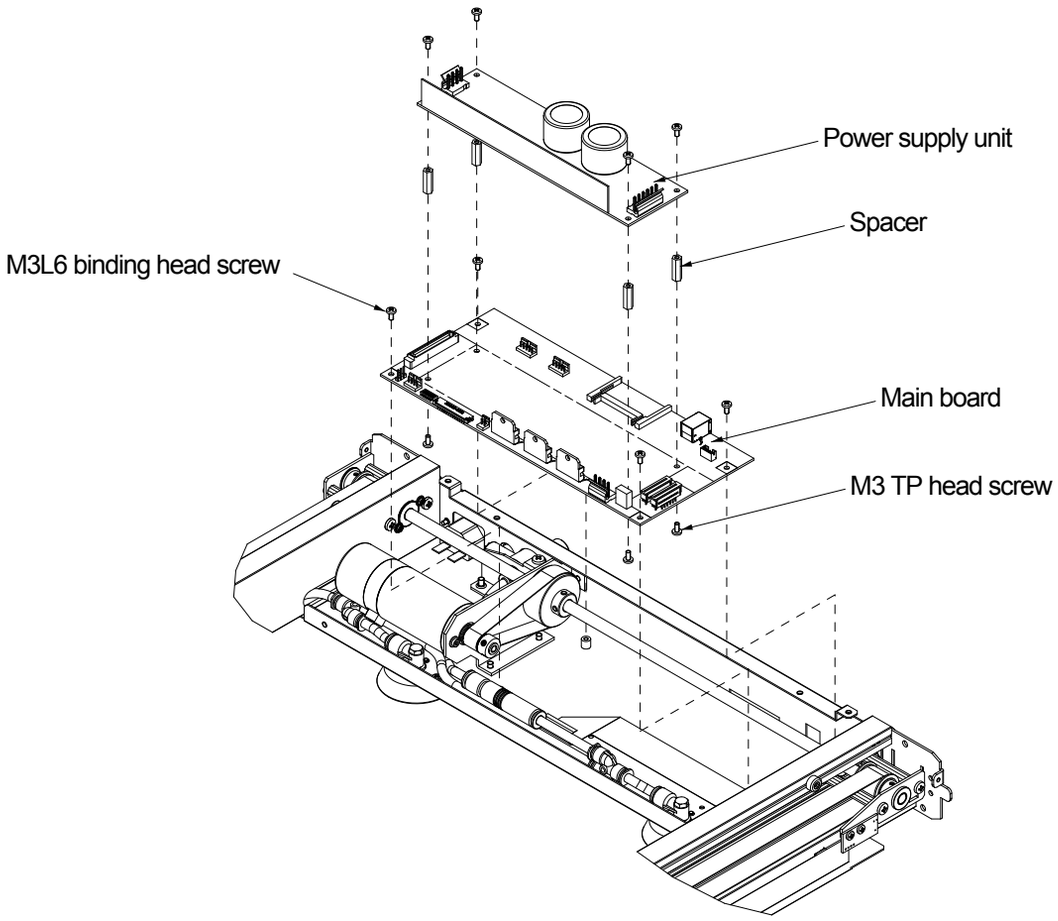
(2) Detach the power supply unit (see Subsection 7.3.1).

(3) Disconnect all the cables and flexible cables from their connectors on the main board.

Connector No.	Connect to:
J3	X-motor
J4	X-motor
J5	X-home sensor
J6	X-flexible cable
J7	X-flexible cable
J8	Power supply unit
J9	Control panel relay board

(4) Detach the interface cable and CF card.

(5) Remove the four M3L6 binding head screws holding the main board.



(6) Detach the main board from the chassis.

(7) Remove the two M3 TP head screws holding the spacers.

How to reinstall the main board

(1) Reattach in the reverse order in which it was detached.

(2) Perform any adjustments required (see Section 8.2).

8. ELECTRICAL ADJUSTMENTS

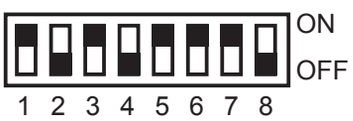
8.1 DIP Switch Settings

Factory presets (Normal Mode)

SW1 to OFF

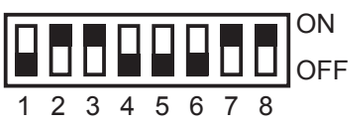
NOV-RAM Clear

SW1 and SW4, SW8 to OFF



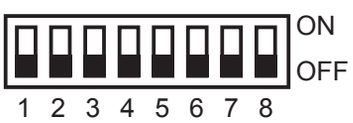
Adjustment mode

SW1 and SW4, SW5, SW6 to OFF



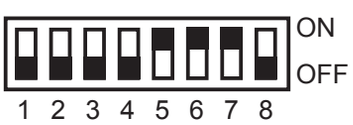
LED lamp test mode

All switches to OFF



Operation key test mode

SW1 and SW2, SW3, SW4, SW8 to OFF



8.2 List of Items Requiring Readjustment

If you replaced one of the units listed in the table below or altered their sensor positions, be sure to readjust the corresponding items.

Item \ Unit name	Main board	Power supply	Pen Block	X-home sensor	Y-relay board	X,Y Motor drive belt	X,Y Motor	X,Y belt
NOV-RAM clear	M							
Pen force adjustment	M		M					
Distance adjustment	M							
Right angle adjustment	M							M
Menu setting	N							
Firmware update	N		M					
Belt tension adjustment	M							
Engraving area confirming						M	M	M
Output voltage of power supply	N	N						

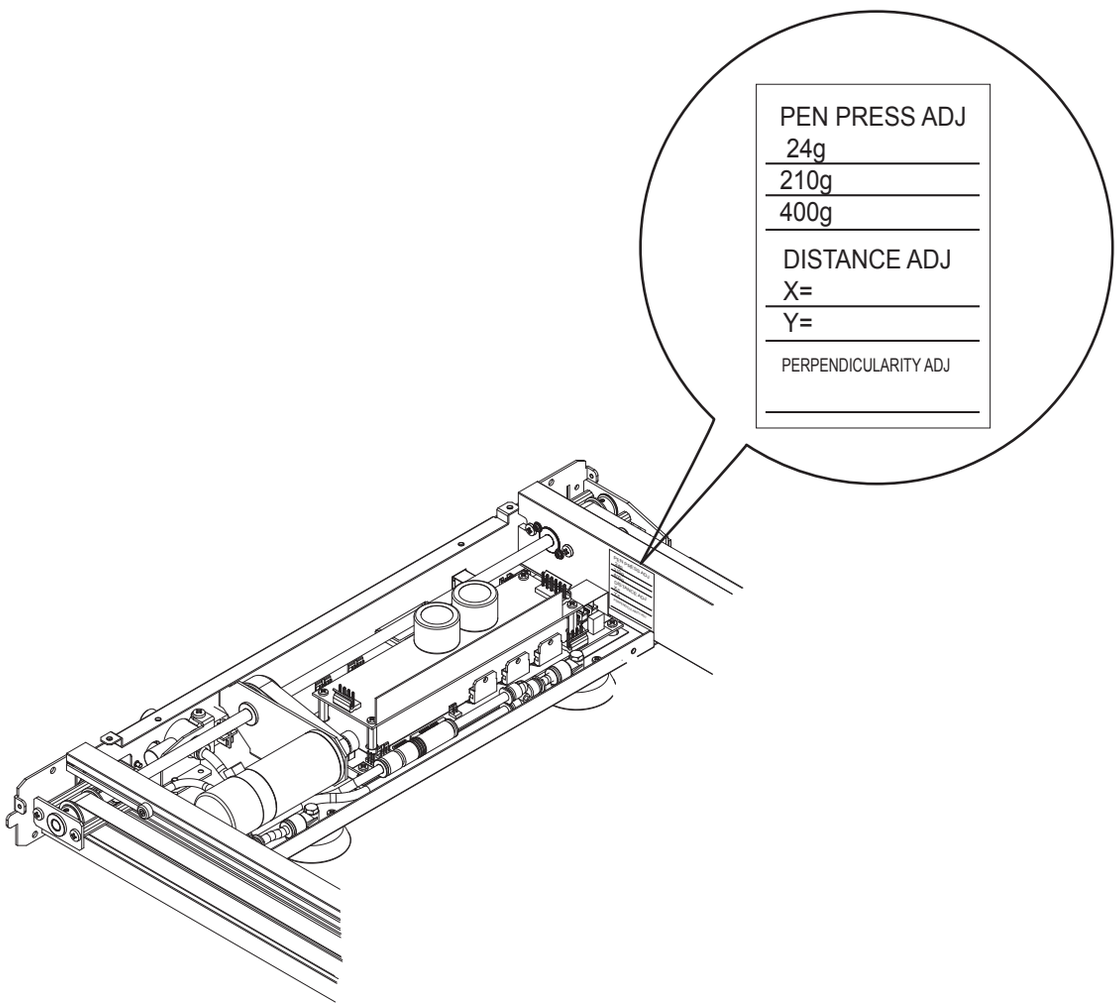
No mark: Unnecessary M: Must always be adjusted N: To be adjusted as necessary

Note: The main board must have the latest version of firmware unless otherwise specified.

8.3 Default Values of the Main Board Settings

(Default factory settings)

The default factory settings are recorded in the location shown below.



You can input the same values when you have replaced the main board without making any adjustments.

If you have changed any values by making adjustments, record those values for the next maintenance check.

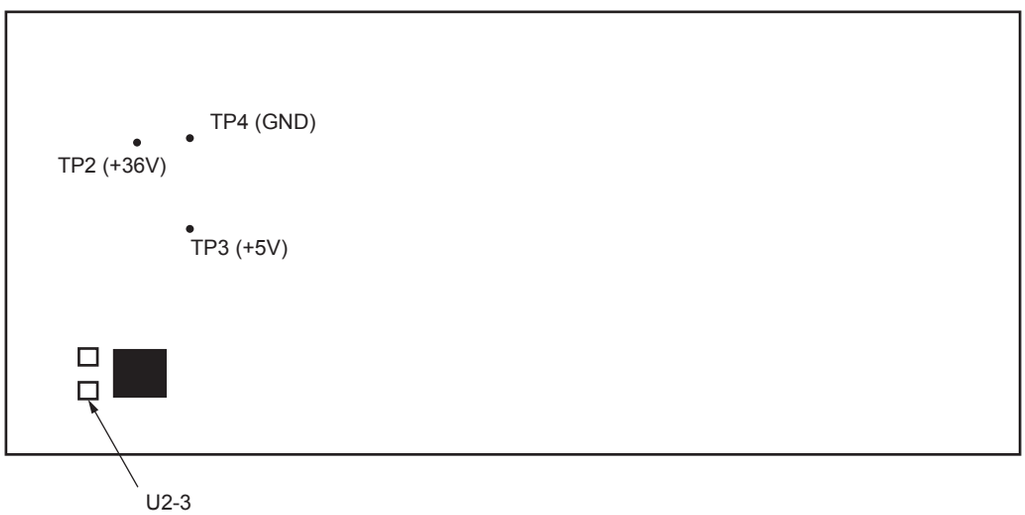
8.4 Confirming the Power Supply Line on the Main Board

When you replace the main board, confirm the power supply line on the main board using the test pins and the ohm tester.

Check that there are no shorted lines between the test pins.

Test pins
TP4 (GND) to TP2 (36V)
TP4 (GND) to TP3 (5V)
TP4 (GND) to U2-3 (3.3V)
TP3 (5V) to TP2 (36V)
TP3 (5V) to U2-3 (3.3V)
TP2 (36V) to U2-3 (3.3V)

Location of the test pins



8.5 Clearing the Non-Volatile RAM

When you replace the main board, you must clear the Non-Volatile RAM (NOV-RAM).

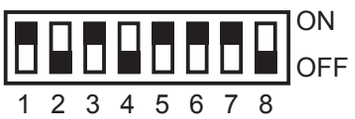
If you clear the Non-Volatile RAM, you will lose the setup parameters for each adjustment.

Input the adjustment values to the main board after you clear the Non-Volatile RAM.

How to clear the Non-Volatile RAM.

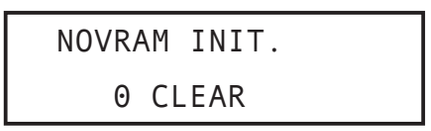
(1) Set the DIP switch to the NOV-RAM clear mode as shown below.

SW1 and SW4, SW8 to OFF



(2) Turn on the power to the engraver.

(3) The NOVRAM INIT. menu appears. The engraver immediately starts to clear the parameters on NOV-RAM, and then sets the default values.



(4) When the programming is complete, the NOVRAM INIT. COMPLETED menu appears.

(5) Turn off the power to the engraver.

(6) Return the SW1 setting to normal mode as shown below.

SW1 to OFF

8.6 Adjusting the Pen Force

This adjustment will set the pen force.

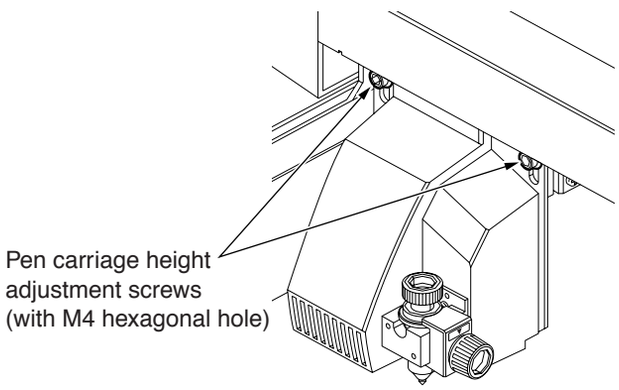
If you replace the main board or clear the Non-Volatile RAM, use the following procedure to input the recorded adjustment values.

If you replace the moving coil and/or the pen block assembly, you must adjust the pen force using the following procedure.

How to adjust the pen force

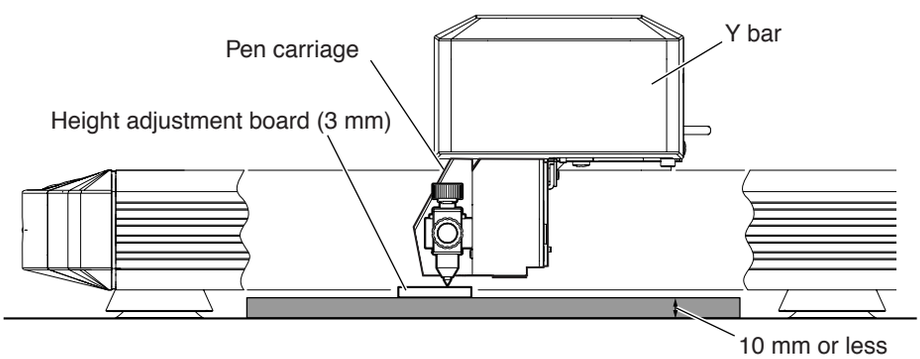
The factory setting of the pen carriage is the lowest position.

To go beyond the range allowed by the blade length adjustment dial, perform the following steps: Switch the power of the engraver off. Then loosen the screws shown in the illustration below, using the supplied M4 Allen wrench. Adjust the distance between the medium and the blade tip to about 3 mm, using the height adjustment board.



(1) Prepare a flat surface such as a table larger than the area of the engraver's suction cups.

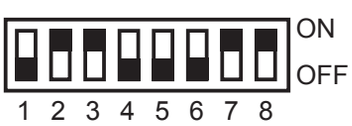
(2) Place the material to be engraved on it.



(3) As in the procedure for a large medium, adjust the distance between the medium and the blade tip to about 3 mm, using the height adjustment board.

(4) Set the DIP switch to the adjustment mode as shown below.

SW1 and SW4, SW5, SW6 to OFF



(5) Turn on the power to the engraver.

(6) The PEN PRESS ADJUST menu appears.

```
  PEN PRESS ADJUST
 PRESS ENTER KEY!
```

(7) Press the ENTER key to display the menu shown below.

```
  PEN PRESS SETTING
                24[g]
```

(8) Press the ENTER key to display the menu shown below.

```
+1         24g      -1
+10        18      -10
```

(9) The pen is lowered. If you have replaced the moving coil and/or the pen block assembly, use the force gauge to measure the actual force. If you have only replaced the main board, input the adjustment values that were recorded.
Use the F1 key to F4 key to change the force setting. The number on the LCD will increase or decrease. If you have replace the moving coil and/or the pen block assembly, measure the actual pen force again. If you replaced the moving coil and/or the pen block assembly, adjust the 24g-pen force. If the measured value is within the specification range (20g to 30g) or if you have input the recorded value, press the ENTER key to store the setting. The next specified pen force appears.

(10) Adjust the 210g-pen force. If the measured value is within the specification range (190g to 230) or if you have input the recorded value, press the ENTER key to store the setting. The next specified pen force appears.

(11) Adjust the 400g-pen force. If the measured value is within the specification range (380g to 420g) or if you have input the recorded value, press the ENTER key to store the setting.

(12) When the adjustment is complete, turn off the power to the engraver.

(13) Return the DIP switch setting to normal mode as shown below.
SW1 to OFF

Specification of the actual pen force

Specified pen force	Actual force range
24g	20 to 30g
210g	190 to 230g
400g	380 to 420g

8.7 Adjusting the Distance Accuracy

This adjustment will set the distance accuracy.

If you replace the main board or clear the Non-Volatile RAM, use the following procedure to input the recorded adjustment values.

How to adjust the distance accuracy

(1) Mount a Ceramic pen (0.2 mm tip size) in the holder.

(2) Load a sheet of A3 size paper or B4 size paper in the engraver.

(3) Set the DIP switch to the adjustment mode as shown below.

SW1 and SW4, SW5, SW6 to OFF

(4) Turn on the power to the engraver.

(5) The PEN PRESS ADJUST menu appears.

```
  PEN PRESS ADJUST
PRESS ENTER KEY!
```

(6) Press the NEXT key three times to display the menu shown below.

```
  DISTANCE ADJUST
PRESS ENTER KEY!
```

(7) Press the ENTER key to display the menu shown below.

```
ORIGINAL     CLEAR
ADJ. DRAW    INPUT
```

F1 key (ORIGINAL) :Draw the test pattern without distance adjustment.

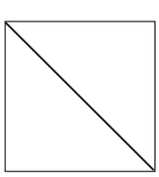
F2 key (ADJ. DRAW) :Draw the test pattern with distance adjustment.

F3 key (CLEAR) :Clear the distance adjustment value.

F4 key (INPUT) :Move to the distance adjustment value setting menu.

(8) Press the F1 key to start the test. The engraver immediately plots the test pattern, and the following menu appears.

```
  DISTANCE ADJUST
X=+ 0          Y=+ 0
```



(9) Remove the paper and measure the X-axis distance, Y-axis distance, and the diagonal distance. If you have replaced the main board only, use the recorded values.

(10) Input the axis adjustment values using the F1 to F4 keys.

Press the F1 or F2 key to change the X-axis adjustment value.

Press the F3 or F4 key to change the Y-axis adjustment value.

The formula of the input value is as follows:

Input value for X-axis or Y-axis = (200 mm - measured distance) x 10

For example:

If you measured 199.7 mm for the X-axis then input 3 for the adjustment value.

0.1-mm steps

(11) Press the ENTER key to display the menu shown below.

```
+0.1  X-Y LENG  -0.1
+0.01 L=282.84 -0.01
```

F1 key (+0.1) :Increase the diagonal distance value in 0.1 mm steps.

F2 key (+0.01) :Increase the diagonal distance value in 0.01 mm steps.

F3 key (-0.1) :Decrease the diagonal distance value in 0.1 mm steps.

F4 key (-0.01) :Decrease the diagonal distance value in 0.01 mm steps.

(12) Input the diagonal adjustment values using the F1 to F4 keys.

The displayed L value is the diagonal distance.

If the measured value is within the displayed L value of the specification range (±0.1 mm) or if you have input the recorded value, press the ENTER key to store the setting.

(13) The following menu appears.

```
 ORIGINAL     CLEAR
 ADJ. DRAW    INPUT
```

(14) If you have changed the diagonal distance value, confirm the axis distance.

Load a new sheet of paper and press the F4 key to draw the adjusted test pattern.

Measure each distance. If the measured value is within the specification range, press the ENTER key to store the setting.

Specification range for the X and Y distances = 200 mm ±0.2 mm.

Specification range for the diagonal distance = within 0.1 mm from the displayed L value.

If the measured value is out of the specification range, adjust again from step (7).

(15) When the adjustment is complete, turn off the power to the engraver.

(16) Return the DIP switch setting to normal mode as shown below.

SW1 to OFF

8.8 Setting the Model Name

This will set the model name for the engraver.

If you replace the main board or clear the Non-Volatile RAM, use the following procedure to input the model name.

If you do not set the model name, the engraver will not communicate via the USB port.

(1) Turn on the power while pressing the DOWN ARROW position key to display the menu shown below.

```
SEL DATA
GRANITE    CHK AREA
```

(2) Press the LOCAL key.

(3) Press the NEXT key twice to display the menu shown below.

```
OPTION1    OPTION2
           SPECIAL
```

(4) Press the F3 key to display the menu shown below.

```
           DIST ADJ
L UNIT         TEST
```

(5) Press the F4 key to display the menu shown below.

```
          SELF TEST
COND. PAT.    DUMP
```

(6) Press the F1 key.

(7) Press the ENTER key while pressing the F1 key to display the menu shown below.

```
MARK EXP   CARCHK M*
MARK MON.     SEIZOU
```

(8) Press the NEXT key three times to display the menu shown below.

```
USB EG
```

(9) Press the F1 key to display the menu shown below.

```
EG SELECT FOR USB
    TYPE=EG1400
```

(10) Select the model name using the UP ARROW (+X) position key or the DOWN ARROW (-X) position keys. The default model name is EG1400.

EG1400 -> CE3000 -> FC5100 -> FC3600 -> EN400A -> EG1400

(11) When the setting is complete, turn off the power to the engraver.

8.9 Updating the System Firmware

To update the system firmware you need to have the following files. In addition, you need to use a computer and USB cable.

- en4av100x :firmware
- OPS651-N :USB Driver software for engraver (EN-400)
  OPS651-UAL :USB Driver software for engraver (EG1400)
- SEND.EXE :Utility to transfer files using Windows®

How to update the system firmware

(1) Connect the computer and the engraver via the USB port.

(2) Turn on the power while pressing the RIGHT ARROW position key and the LEFT ARROW position key to display the menu shown below.

```
USB
```

(3) Press the ENTER key to display the menu shown below.

```
PLEASE SEND PRG.
```

(4) Send firmware to the engraver from the computer.
Drag and drop the firmware file onto the SEND.EXE icon when using Windows®.

(5) The following menu is displayed while data is being received.

```
RECEIVING PROGRAM
**KB    COMPLETE
```

If the engraver could not receive the data,
Check the following:
1. Printer driver output port
2. The selected firmware file name
3. USB cable connection

(6) The engraver will start the initialization routine when all the data has been received. The firmware version is displayed during the initialization routine. Check the firmware version that you updated.

(7) Turn off the power.

9. SERVICE MODES

9.1 Test Print Mode

This mode print the conditions list, the self-test pattern, and the data dump list.

How to selest the test print modes

(1) Load an A4 (Letter) or larger size sheet of paper in the engraver.

(2) Turn on the power while pressing the DOWN ARROW key to display the menu shown below.

```
SEL DATA
GRANITE    CHK AREA
```

(3) Press the LOCAL key.

(4) Press the NEXT key until the following menu is displayed.

```
OPTION1    OPTION2
           SPECIAL
```

(5) Press the F3 key to display the menu shown below.

```
           DIST ADJ
L UNIT         TEST
```

(6) Press the F4 key to display the menu shown below.

```
          SELF TEST
COND. PAT.    DUMP
```

F2 key : Prints the conditions list of the engraver.

F3 key : Prints the self-test pattern until the power is turned off.

F4 key : Prints the data dump list when data is received.

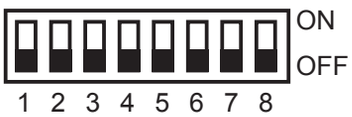
(7) Turn off the power to the engraver to end this mode.

9.2 LED Lamp Test Mode

This mode checks the LED lamp status.

(1) Set the DIP switch to the LED lamp test mode as shown below.

All switches to OFF



(2) Turn on the power to the engraver.

(3) If the LED lamp status is good, the corresponding LED lamp lights as shown below.

POWER LED lamp : Lights green.

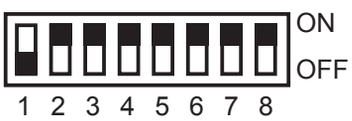
LOCAL LED lamp : Green light blinks alternately with the PROMPT LED lamp

PROMPT LED lamp : Green light blinks alternately with the LOCAL LED lamp

(4) Turn off the power to the engraver to end this mode.

(5) Return the DIP switch setting to normal mode as shown below.

SW1 to OFF



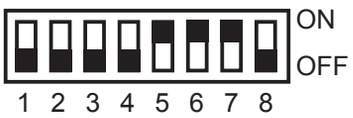
9.3 Control Panel Membrane Switch Test Mode

This mode checks the control panel membrane switch status. If there is a bad switch you may have trouble with the control panel membrane switch panel or the control panel relay board.

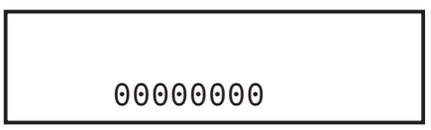
How to test the control panel membrane switches

(1) Set the DIP switch to the operation key test mode as shown below.

SW1 and SW2, SW3, SW4, SW8 to OFF



(2) Turn on the power to the engraver to display the status shown below.



(3) Press each key on the control panel; the status will change as shown below.

The status of the LCD

Key	Status of the LCD
RIGHT ARROW	00000008
DOWN ARROW	00000400
UP ARROW	00000004
LEFT ARROW	00008000
F1	00000001
F2	00000002
F3	00000100
F4	00000200
NEXT	00001000
ENTER	00000010

(4) When testing is completed, turn off the power to the engraver.

(5) Return the DIP switch setting to normal mode as shown below.

SW1 to OFF

10. TROUBLESHOOTING

10.1 The Engraver Doesn’t Operate After It is Turned On

Symptom	Verification item	Solution
The control panel’s LED lamp does not light or the LCD does not display anything.	(1) Is the engraver being supplied with power?	No .... Check that the power cord is securely connected to the engraver’s AC line inlet. Yes ... Verify item (2).
	(2) Is the FPC08244 flexible cable securely connected to the main board and the control panel?	No .... Connect the flexible cable securely. Yes ... Verify item (3).
	(3) Is the FPC08244 flexible cable broken?	No .... Verify item (4). Yes ... Replace the FPC08244 flexible cable.
	(4) Is the AC line electrical output correct?	No .... Change the AC line. Yes ... Verify item (5).
	(5) Does the power supply unit have a correct output?	No .... Replace the power supply unit. Yes ... Replace the main board.
The POWER LED lamp lights but the LCD does not display anything.	(1) The ROM and RAM are defective .	Replace the main board.
The POWER LED lamp lights and the LCD displays a sum check error.		

10.2 During Engraving Operations

Symptom	Verification item	Solution
The data in the CF card is not displayed.	(1) Was the data saved using the specified driver?	Yes ... Verify item (2). No..... Create the data using the OPS651 driver.
	(2) Was the specified CF card used?	Yes ... Verify item (3). No..... Use the SanDisk CF card.
	(3) Is the CF card damaged?	Yes ... Replace the CF card with a new one. No..... Insert the CF card securely.
Data cannot be saved to the CF card. (Windows XP/2000)	(1) Was the drive for the CF card specified?	Yes ... Verify item (2). No..... Refer to the user's manual "Creating Data for Engraving (For CF Card)".
	(2) Was the engraver in on-line mode when saving the data?	No..... Save the data in on-line mode.
The engraving image from the CF card or through the USB is partially missing (about 3/4). (Windows XP/2000)	(1) Was the paper setting specified correctly in the print setting procedure?	No..... Refer to the user's manual "Creating Data for Engraving (For CF Card)" and "Engraving in the Online Mode through the USB".
The data cannot be transferred through the USB.	(1) Is the connector properly connected?	Yes ... Verify item (2). No..... Insert the connector as deep as it will go.
	(2) Is the driver installed?	No..... Install the driver. Yes ... Verify item (3)..
	(3) Is the engraver off-line?	Yes ... Change the mode to on-line.
The engraved results are unsatisfactory.	(1) Is the MATERIAL setting suitable for the material type being used?	Yes ... Verify item (2). No..... Select the suitable material in the MATERIAL setting.
	(2) Is the tip of the engraving blade sharp?	Yes ... Replace the push roller sensor. No..... Replace the engraving blade with a new one.
	(3) Is the distance between the engraving blade and the material even?	No..... Adjust the distance to 3 mm using the supplied height adjustment board.

10.3 Error Displays

Error Display	Verification item	Solution
X POSITION ALARM	(1) Was the pen carriage lever set to LOCK?	No.....Verify item (2) Yes ...Set the lever to FREE.
	(2) Does the X-slider move smoothly?	No.....Check and adjust the X-belt tension and X-motor belt tension. Yes ...Verify item (3).
	(3) Is the X-flexible cable securely connected?	No.....Connect it securely. Yes ...Replace the X-flexible cable if it was defective.
	(4) Is the X-home sensor plate position correct?	No.....Check and adjust the X-home sensor plate position. Yes ...Verify item (5).
	(5) Is the X-home sensor position correct?	No.....Check and adjust the X-home sensor position. Yes ...Replace the X-home sensor if it was defective.
	(6) Does the X-motor move smoothly?	No.....Replace the X-motor if it was defective. Yes ...Replace the main board if it was defective.
Y POSITION ALARM	(1) Was the pen carriage lever set to LOCK?	No.....Verify item (2) Yes ...Set the lever to FREE.
	(2) Does the Y-slider move smoothly?	No.....Check and adjust the Y-belt tension and Y-motor belt tension. Yes ...Verify item (3).
	(3) Is the Y-flexible cable securely connected?	No.....Connect it securely. Yes ...Replace the Y-flexible cable if it was defective.
	(4) Is the Y home sensor plate position correct?	No.....Check and adjust the Y home sensor plate position. Yes ...Verify item (5).
	(5) Is the Y home sensor position correct?	No.....Check and adjust the Y home sensor position. Yes ...Replace the Y home sensor or Y relay board if it was defective.
	(6) Does the Y-motor move smoothly?	No.....Replace the Y motor if it was defective. Yes ...Replace the main board if it was defective.

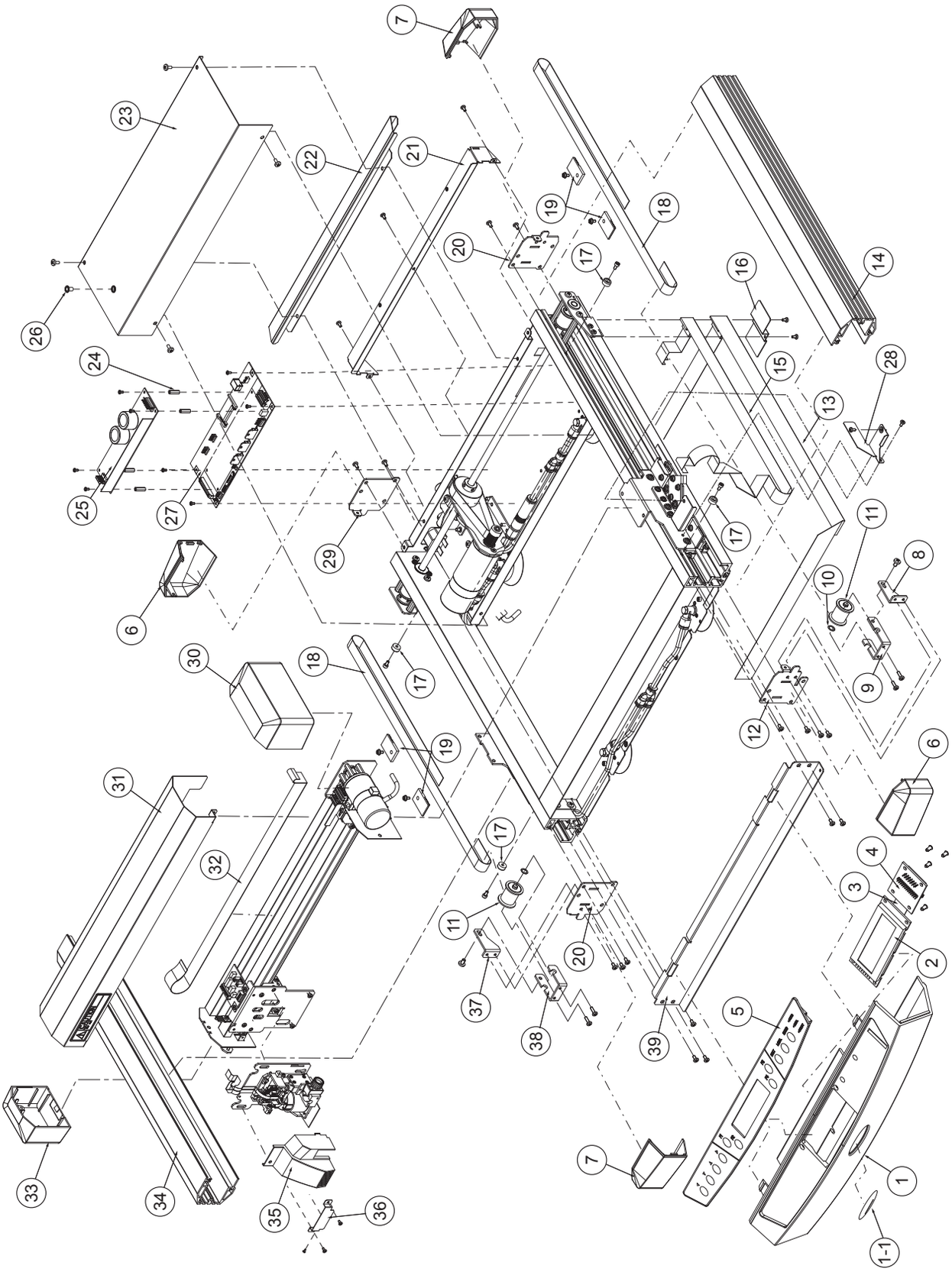
Error Display	Verification item	Solution
ERROR 1 Command Error	(1) Did the engraver receive an unrecognizable command?	No.....Verify item (1) Yes ...Send correct data to engraver.
	(2) Is there any noise on the line?	No.....Verify item (2) Yes ...Check the USB cable or move the engraver to another place.
	(3) Was the correct model name set for the engraver?	No.....Set the correct model name. Configure your software application menu to permit Graphtec engraver control. Re-specify the software application's interface conditions
ERROR 4 Parameter Overflow	The numeric parameter of an input command exceeds its permissible range.	Configure your software application menu to permit Graphtec engraver control. Re-specify the software application's interface conditions. Set the correct model name if it was incorrect.
ERROR 5 I/O Error	An error related to the receipt of data occurred within the interface.	

11. PARTS LIST

11.1 Main Frame

No.	Part No.	Description	Q'ty	Remarks
1	618244001	Control Cover Assy for EG1400	1	EG1400 (Cobalt color)
	618244301	Control Cover Assy for EN-400A	1	EN-400A (Yellow color)
1-1	621154500	Emblem CE2K	1	
2	798240704	LCD Assy	1	GMD2020B
3	691824130	LCD Control Flexible Cable	1	FPC08243
4	798240702	Control Panel Relay Board	1	
5	691824050	Control Panel Switch Sheet	1	PR290705
6	618244060	Right Corner Cover for EG1400	2	EG1400 (Cobalt color)
	618244320	Right Corner Cover for EN-400A	2	EN-400A (Yellow color)
7	618244120	Left Corner Cover for EG1400	2	EG1400 (Cobalt color)
	618244330	Left Corner Cover for EN-400A	2	EN-400A (Yellow color)
8	618242050	Right X-Tension Plate	1	
9	618242031	Right X-Tension Bracket	1	
10	394000080	Bush MSRB6-02	2	
11	622190130	X-Tension Pulley	2	
12	618242071	Front Right X-Rail Bracket	1	
13	691824140	Control Flexible Cable	1	FPC08244
14	618244031	Right X-Rail Cover	1	
15	691824110	X-Flexible Cable	2	FPC08241
16	618240010	Flexible Cable Stopper	1	
17	304511008	Rubber Stopper	4	
18	618242110	X-Belt	2	
19	618002180	X-Belt Stopper	4	
20	618242081	Front Left & Rear Right X-Rail Bracket	2	
21	618244011	Rear Under Bracket	1	
22	618244050	Rear Cover Assy for EG1400	1	EG1400 (Cobalt color)
	618244310	Rear Cover Assy for EN-400A	1	EN-400A (Yellow color)
23	618244020	Top Cover	1	
24	393530170	Spacer AS-317	4	
25	500051585	Power Supply Board	1	
26	618244071	Stopper Holder	1	
27	771824500	Main Board	1	
28	618242340	X-Slider Flexible Cable Stopper	1	
29	618242091	Rear Left X-Rail Bracket	1	
30	618244140	Y-Motor Cover	1	
31	618244081	Y-bar Cover	1	
32	691824120	Y-Flexible Cable	1	FPC08242
33	618244130	Y-End Cover	1	
34	618244041	Left X-Rail Cover	1	
35	618244090	Pen Block Cover	1	
36	618243330	Flexible Cable Guide	1	
37	618242060	Left X-Tension Plate	1	
38	618242041	Left X-Tension Bracket	1	
39	618240060	Side beam	1	

Main Frame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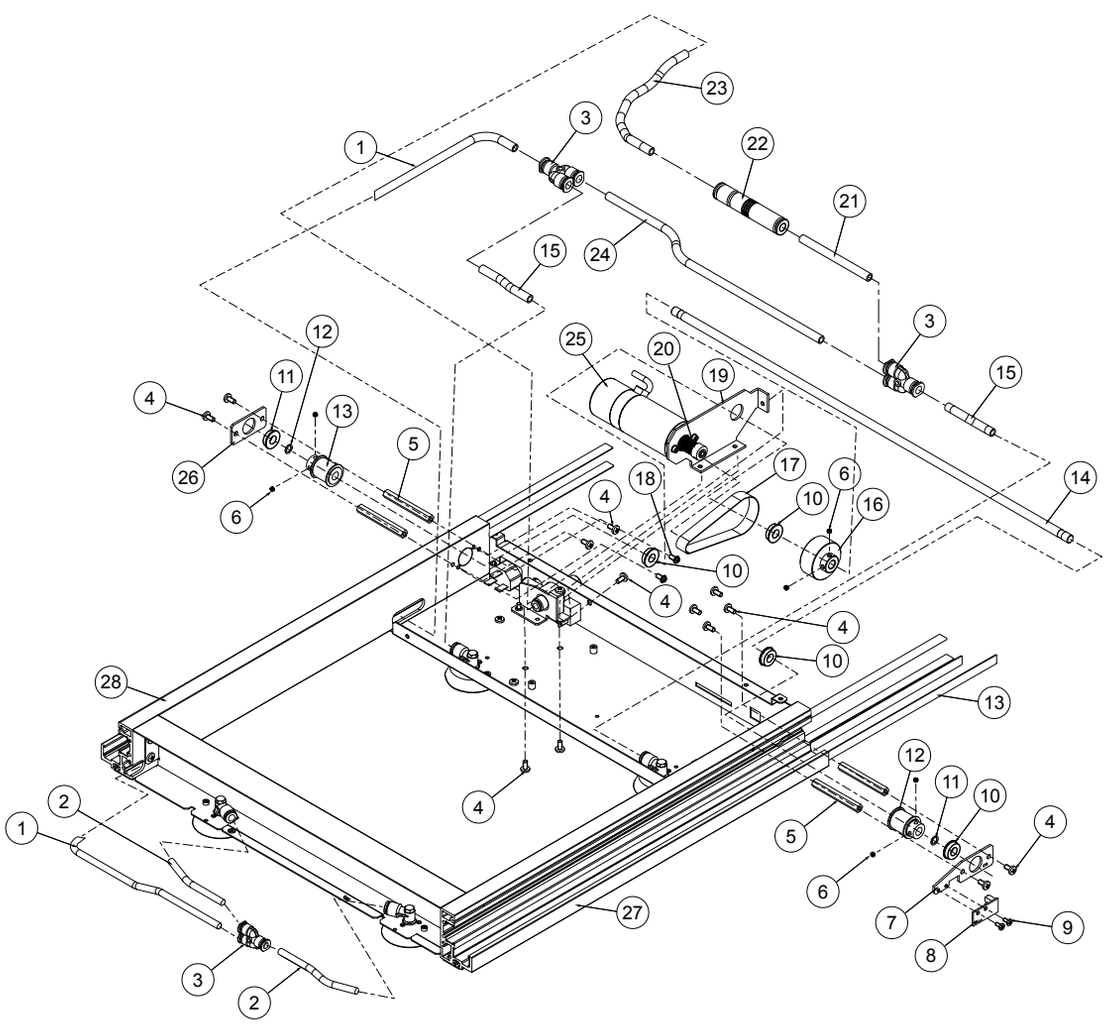
11.2 X Drive Assy

No.	Part No.	Description	Q'ty	Remarks
1		Air Tube ø6 590 mm	1	
2		Air Tube ø6 100 mm	2	
3	305602007	Joint PY-6M	3	
4		M4L8 Binding Head Screw	11	
5		Spacer ASB-450	4	
6		M4L3 Set Screw	6	
7	618242021	Right X Bracket	1	
8	798240701	X-Home Sensor Board	1	
9		M3L6 Binding Head Screw	2	
10	618243011	Bearing	3	F688ZZ
11	39400009	MSRB6-05	2	
12	622190151	X-Pulley	2	
13	618242330	X Lining Plate	8	
14	618242100	X Drive Shaft	1	
15		Air Tube ø6 50 mm	2	
16	618242021	X Drive Pulley	1	
17	378011091	Belt	1	120S2m220UG
18		M3L6 TP Head Screw	4	
19	618242000	X-Motor Bracket	1	
20	054112100	X-Motor Pulley	1	
21		Air Tube ø6 90 mm	1	
22	305602008	Vacuum Ejector	1	ZU07
23		Air Tube ø6 150 mm	1	
24		Air Tube ø6 240 mm	1	
25	771824570	X-Motor	1	UGFMD-B5LGRA5
26	618242021	Left X Bracket	1	
27	618242200	Right X-Rail	1	
28	628242210	Left X-Rail	1	

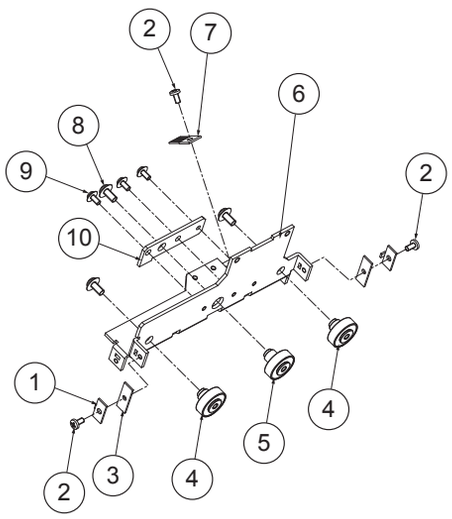
X Drive Assy



11.3 Left X-Slider Assy

No.	Part No.	Description	Q'ty	Remarks
1	054212151	Wiper Stopper	2	
2		M3L6 Binding Head Screw	3	
3	054212140	Wiper	2	
4	618242310	Roller Bearing S	2	
5	618242240	Roller Bearing L	1	
6	618242231	Left X-Slider	1	
7	035132220	Anti-Static Brush	1	
8		M4L8 TP Head Screw	3	
9		M3L6 TP Head Screw	3	
10	618242260	Pressure Arm Plate	1	

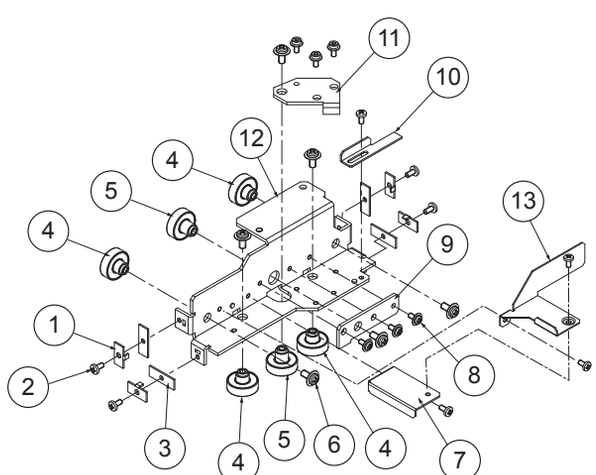
Left X-Slider Assy



11.4 Right X-Slider Assy

No.	Part No.	Description	Q'ty	Remarks
1	054212151	Wiper Stopper	4	
2		M3L6 Binding Head Screw	8	
3	054212140	Wiper	4	
4	618242310	Roller Bearing S	4	
5	618242240	Roller Bearing L	2	
6		M4L8 TP Head Screw	6	
7	618242270	X-Flexible Cable Bracket	1	
8		M3L6 TP Head Screw	6	
9	618242260	Pressure Arm Plate	1	
10	618242280	X-Sensor Plate	1	
11	618242290	Horizontal Pressure Arm Plate	1	
12	618242221	Right X-Slider	1	
13	618242340	X-Flexible Cable Stopper	1	

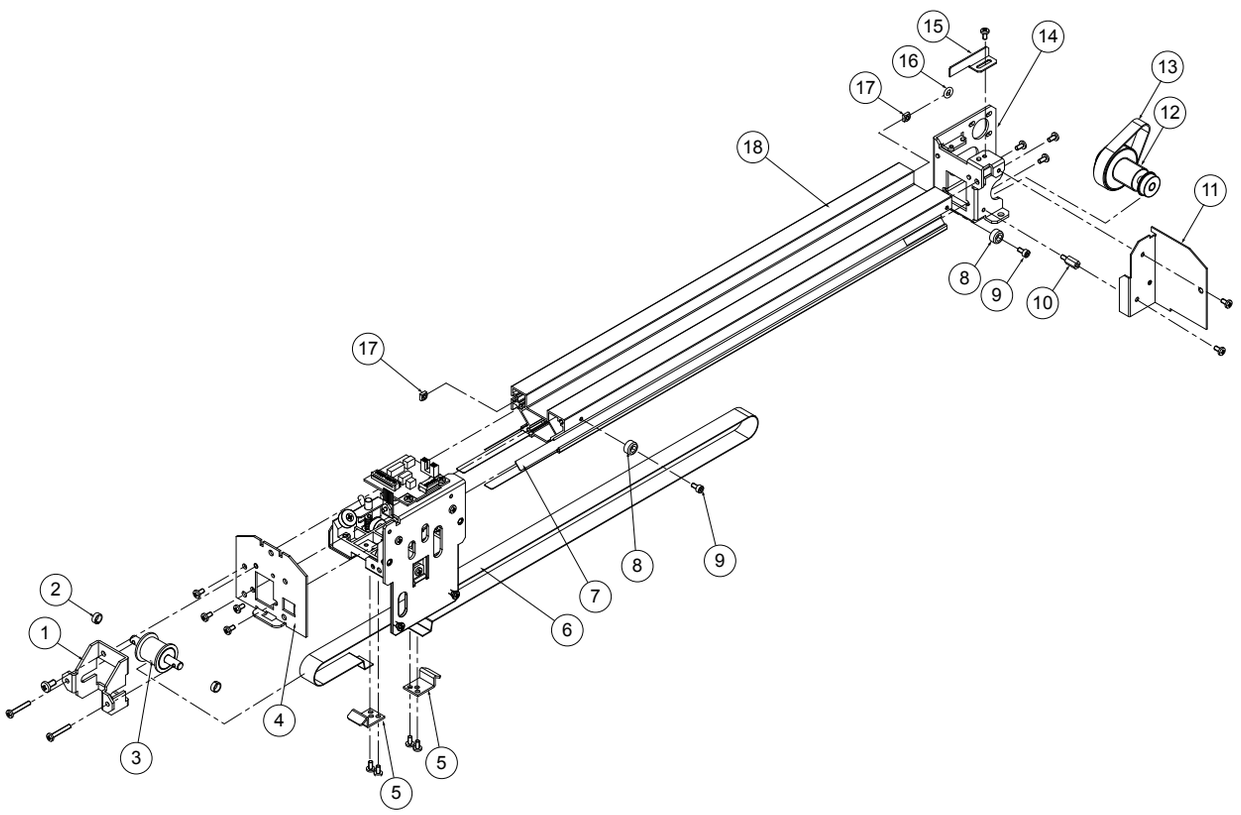
Right X-Slider Assy



11.5 Y-bar Assy

No.	Part No.	Description	Q'ty	Remarks
1	618243050	Y-Tension Bracket	1	
2		Bush 6 x 3	2	
3	618243080	Y-Tension Pulley assy	1	
4	618243041	Y-Tension Base	1	
5	618243050	Y-Belt Stopper	1	
6	618243092	Y-Belt	1	
7	618243310	Y Lining Plate	4	
8	304511008	Rubber Stopper	2	
9		M3L6 Cap Screw	2	
10		Spacer BSB-310	1	
11	618243011	Y Right Side Plate	1	
12	618243020	Y Drive Pulley Assy	1	
13	378007041	Y Drive Belt	1	100S2M140UG
14	618243000	Y-Motor Bracket	1	
15	618243320	Y-Sensor Plate	1	
16		O-ring	1	
17		M3 Square Nut	1	
18	618243301	Y-Rail	1	

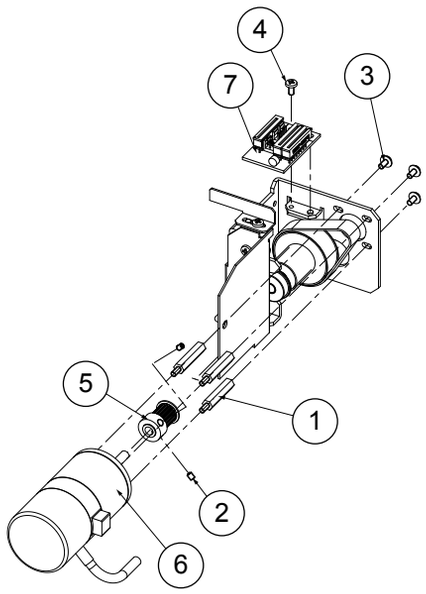
Y-bar Assy



11.6 Y-Motor Assy

No.	Part No.	Description	Q'ty	Remarks
1	394000004	Spacer BSB-310	3	
2		M3L4 Set Screw	2	
3		M3L6 TP Head Screw	3	
4		M3L6 Binding Head Screw	1	
5	618243030	Y-Motor Pulley 18Z12	1	
6	509000041	Y-Motor	1	UGFMED-B5TGRA4
7	798240705	X Relay Board	1	

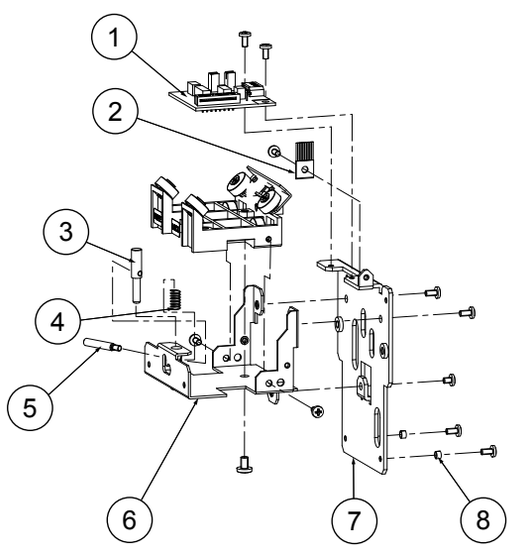
Y-Motor Assy



11.7 Y-Slider Base

No.	Part No.	Description	Q'ty	Remarks
1	798240703	Y-Relay Board	1	
2	035132220	Anti-electrostatic Brush	1	
3	618243270	Stopper Shaft A2	1	
4	380101311	Stopper Spring	1	
5	618243290	Stopper Shaft C	1	
6	618243230	Y-Slider Under Cover	1	
7	618243211	Y-Slider Base	1	
8		Bush 3 x 2.5	2	

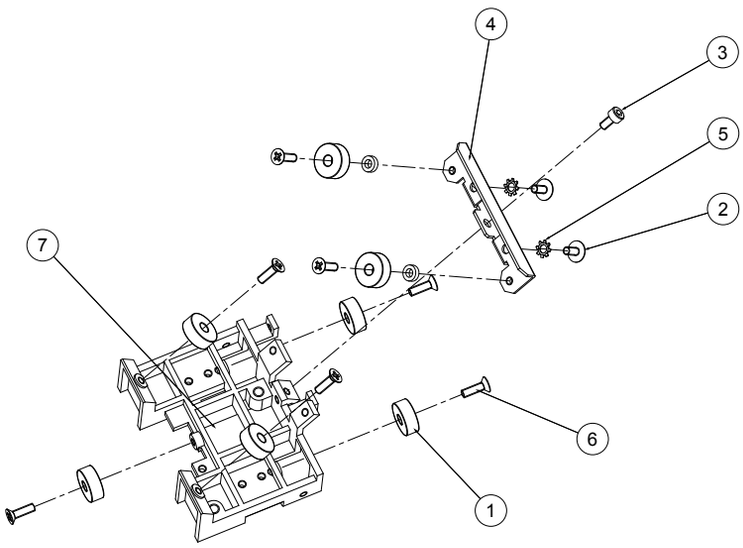
Y-Slider Base



11.8 Y-Slider

No.	Part No.	Description	Q'ty	Remarks
1	310062400	Bearing Roller	5	624ZZ
2		M3L6 TP Head Screw	2	
3		M3L6 Cap Screw	1	
4	618243220	Slider Tension Arm Plate	1	
5		Washer D3	1	
6		M3L10 Pan Head Screw	5	
7	618243202	Y-Slider 2907	1	

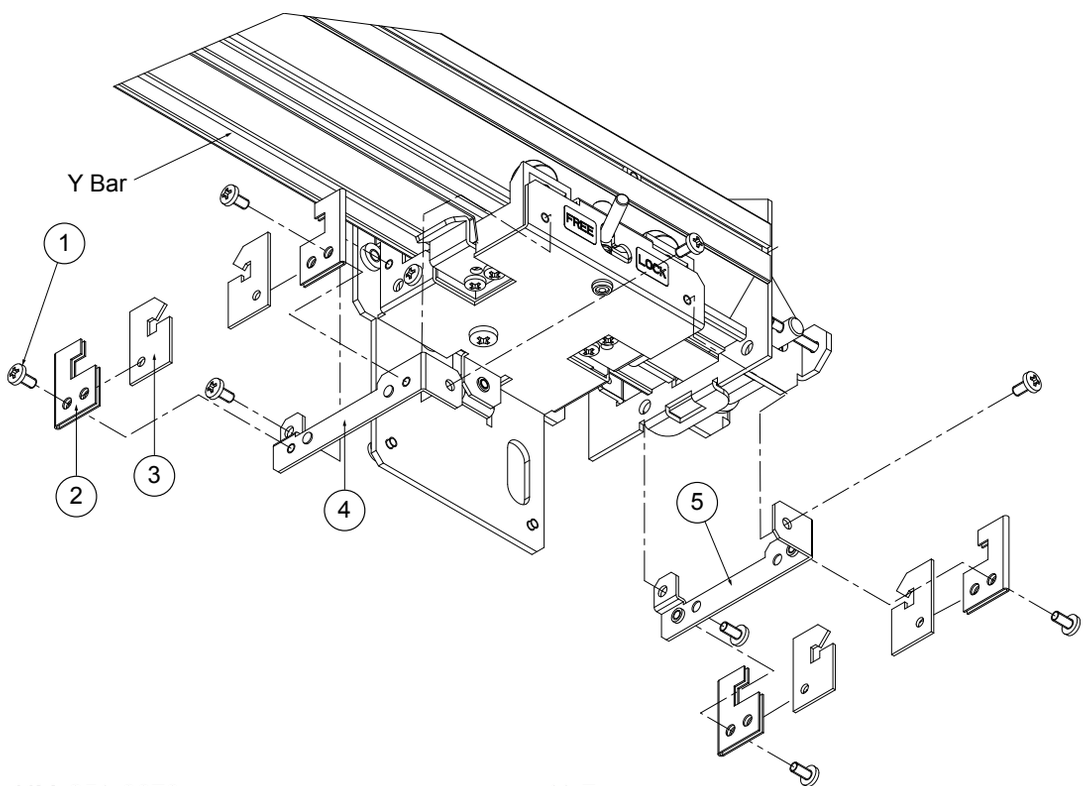
Y-Slider



11.9 Y-Slider Bottom Casing

No.	Part No.	Description	Q'ty	Remarks
1		M3L6 Binding Head Screw	8	
2	618243391	Wiper Holder	4	
3	618243240	Wiper	4	
4	618243260	Right Wiper Bracket	1	
5	618243250	Left Wiper Bracket	1	

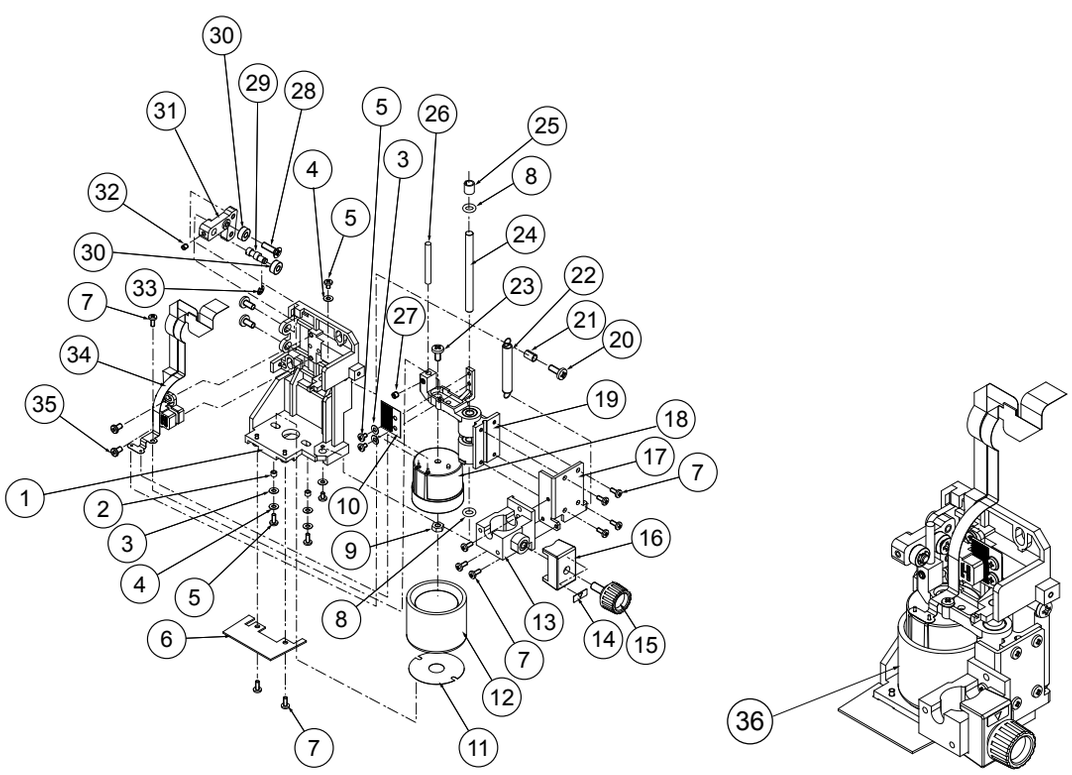
Y-Slider Bottom Casing



11.10 Pen Block

No.	Part No.	Description	Q'ty	Remarks
1	618243400	Moving Coil Base	1	
2		Bush PT-2002	2	
3		Fiber Washer D2	4	
4		Washer D2	4	
5		M2L3 Binding Head Screw	6	
6	618243450	Bottom Plate	1	
7		M2L5 Binding Head Screw	10	
8	340804012	O-ring S-4	2	
9		M3 Nut (Brass)	1	
10	617363351	Pen Encoder Strip	1	
11	095704040	Insulating Sheet	1	
12		Yoke PMI008Y	1	
13	618243510	Pen Holder 2907	1	
14	622192220	Triangle Label	1	
15	621113590	Thumb Screw L10	1	
16	622192022	Cutter Holder B	1	
17	618243500	Pen Holder Bracket	1	
18	095704101	Moving Coil PM1008A	1	
19		Pen Arm Assy	1	Pen Arm 2907+LB4Y x 2
20		M3L8 Binding Head Screw	1	
21		Bush 3 x 6	1	
22	380205381	Spring E-538	1	
23		M3L6 Binding Head Screw (Brass)	1	
24	021500650	Slide Shaft	1	
25		Bush 4 x 4.5	1	
26	617363390	Guide Shaft	1	
27		M3L3 Set Screw	1	
28		M3L10 Pan Head Screw	1	
29	619003371	Offset Shaft S	1	
30	310062400	Bearing Roller	2	683ZZS
31	619003360	Bearing Roller Base Bracket	1	
32		M3L6 Binding Head Screw	2	
33		E-ring D2	1	
34	500050122	Pen Encoder Flexible Cable	1	
35		M3L2.6 No.0 Screw	2	
36	798240700	Pen block Assy	1	

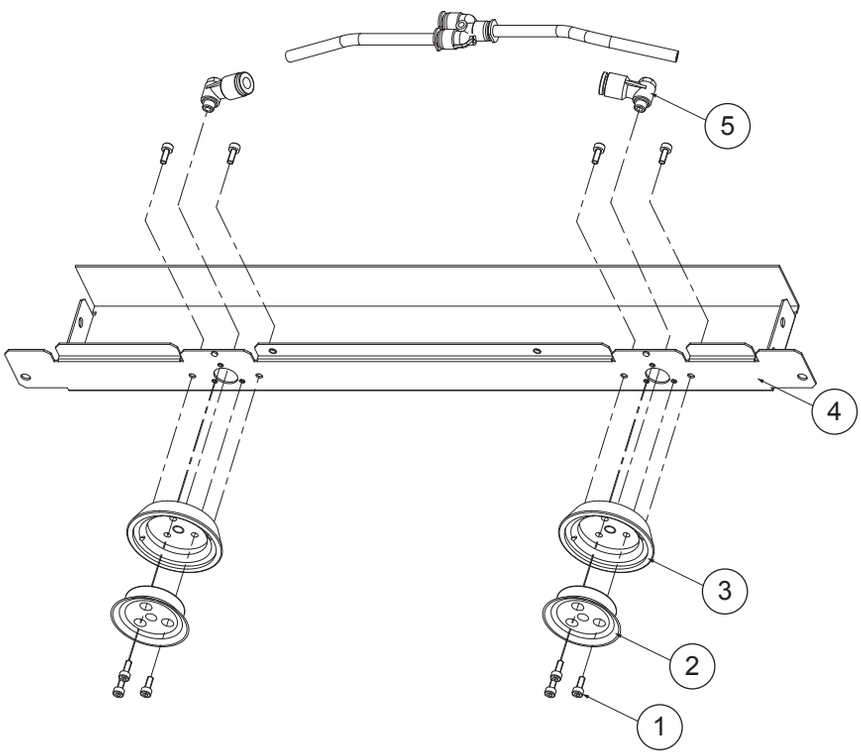
Pen Block



11.11 Front Frame

No.	Part No.	Description	Q'ty	Remarks
1		M3L8 Cap Screw	8	
2	308002255	Suction cup (ZP40HE)	2	
3	618240020	Foot Base	2	
4	618240051	Front Frame	1	
5	305602007	Joint PH06-6M	2	

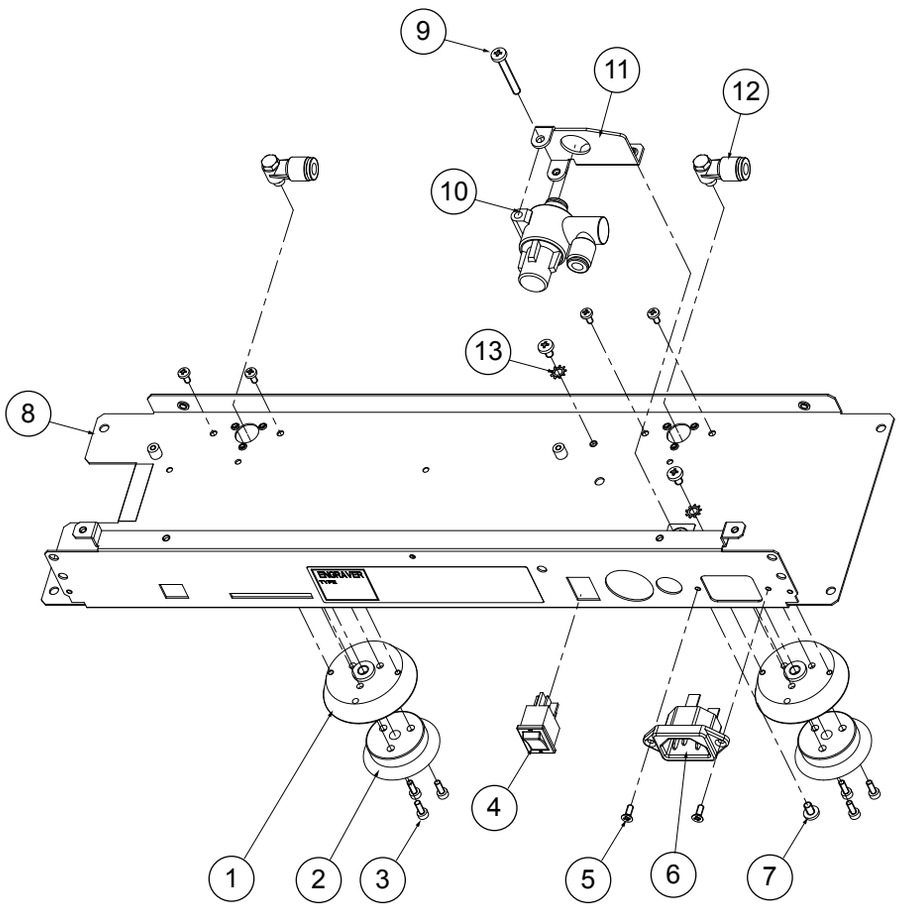
Front frame



11.12 Rear Frame

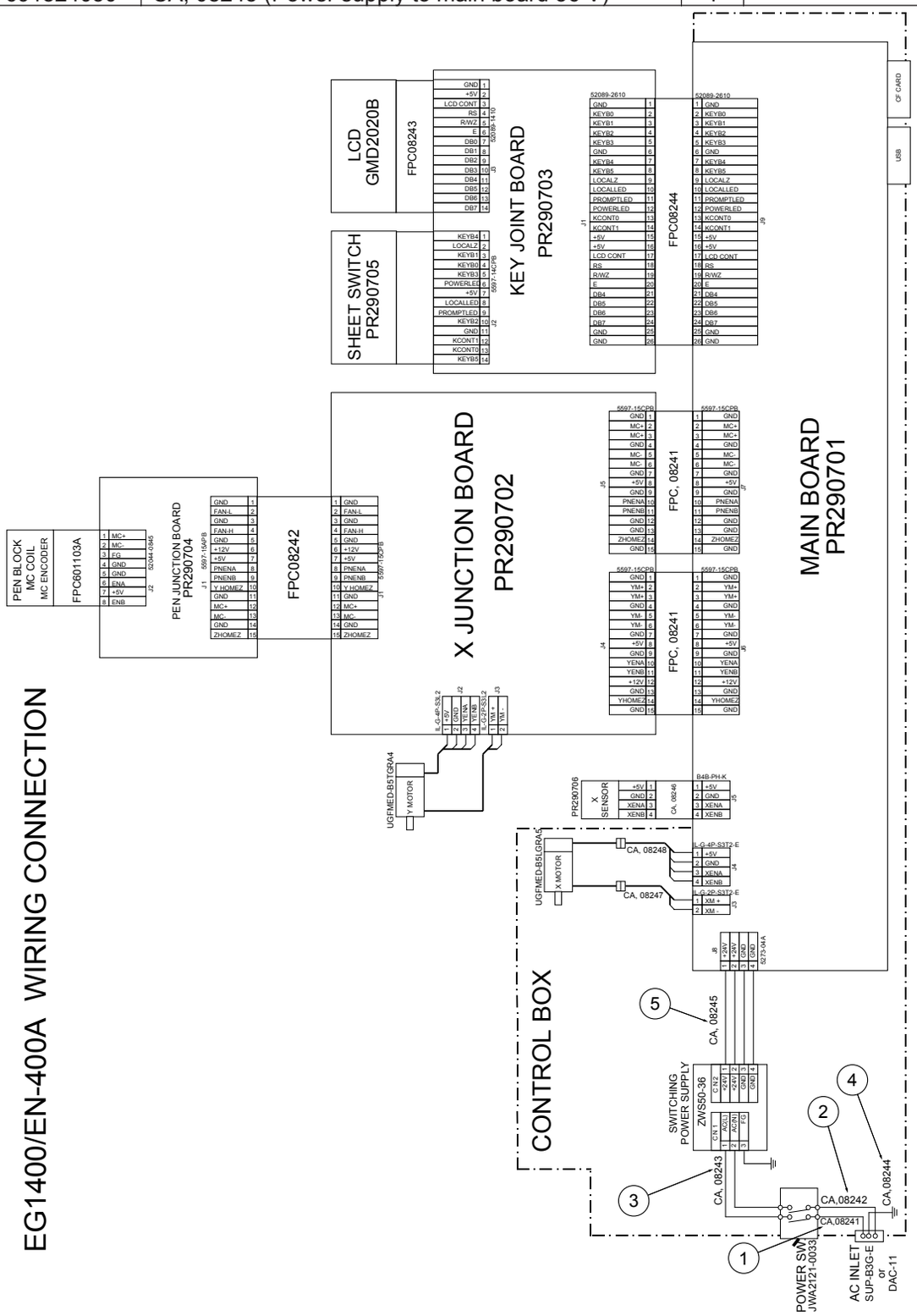
No.	Part No.	Description	Q'ty	Remarks
1	618240020	Foot Base	2	
2	308002255	Suction cup (ZP40HE)	2	
3		M3L8 Cap Screw	8	
4	500051717	AC Power Switch	1	
5		M3L8 pan head screw	2	
6	500051725	Inlet	1	
7		M3L6 binding head screw	3	
8	618240002	Rear chassis	1	
9		M4L30 binding head screw	1	
10	305602005	Filter ZFB100-M6	1	
11	618240031	Filter Bracket	1	
12	305602007	Joint PH06-6M	2	
13		Washer D4	2	

Rear frame



11.13 Cables

No.	Part No.	Description	Q'ty	Remarks
1	691824011	CA, 08241A (Inlet to switch, brown)	1	
2	691824021	CA, 08242A (Inlet to switch, blue)	1	
3	691824031	CA, 08243B (Switch to power supply,)	1	
4	691824041	CA, 08244A (Inlet to GND)	1	
5	691824050	CA, 08245 (Power supply to main board 36 V)	1	



11.14 Other Parts

Standard Accessories

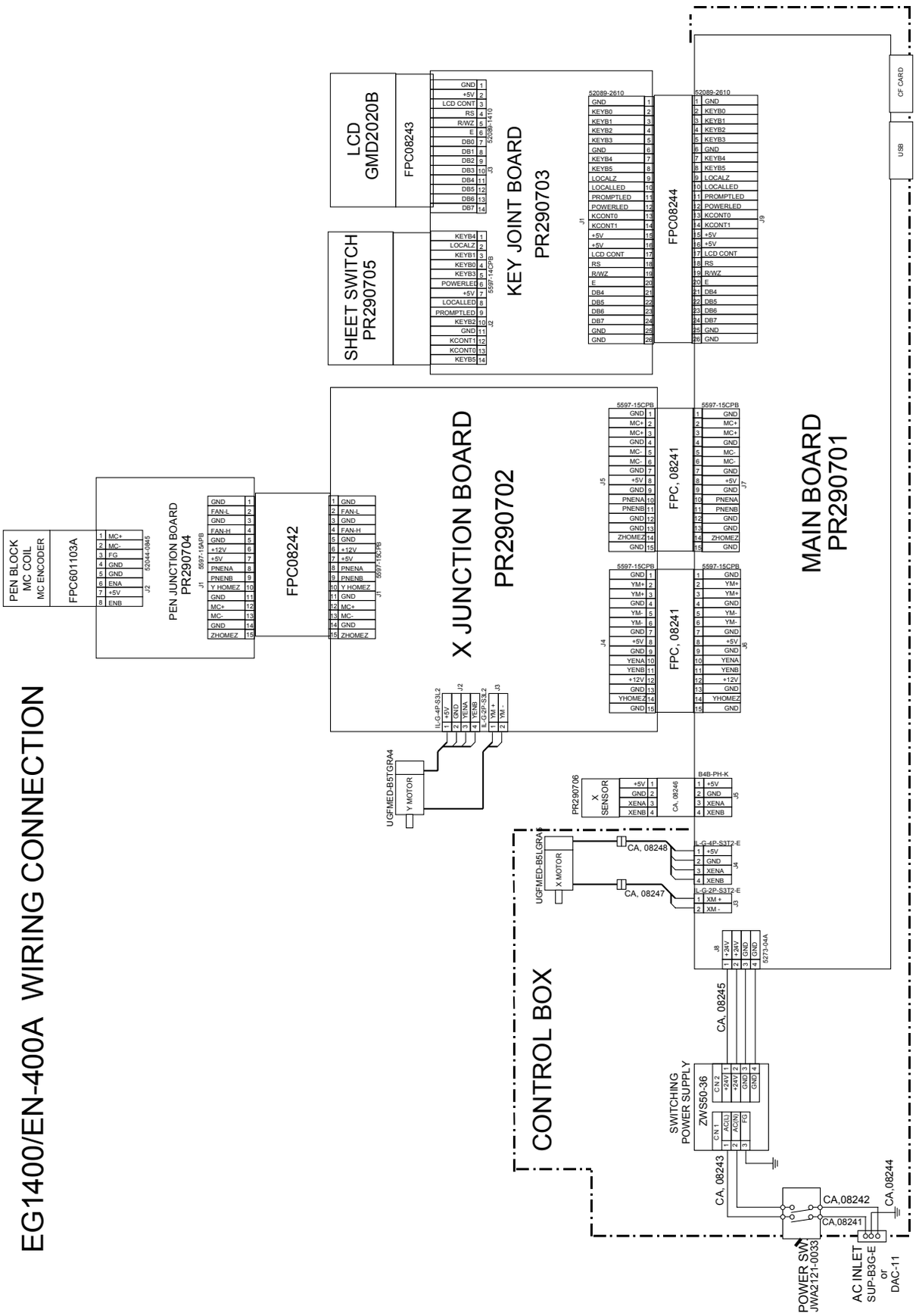
No.	Part No.	Description	Q'ty	Remarks
1	618249010	Height adjustment board	1	
2	302200020	Allen wrench 2.5	1	(Side length 2.5 mm)
3	305811004	Allen wrench M4	1	(Side length 3 mm)
4	618249110	User's manual, EN400A-UM-101	1	EN-400A
	618249111	User's manual, EG1400-UM-151		EG1400
5	618249220	Driver software OPS651-N	1	EN-400A
		Driver software OPS651-UAL	1	EG1400
	308052002	NANIWA EXE(E)	1	EG1400
6	EGP-B30-3	Plunger for engraving	1	
7	EGP-332U-60K	Engraving blade	1	

Packing Boxes

No.	Part No.	Description	Q'ty	Remarks
1	618249300	Packing Box	1	
2	618249320	Packing material for Y-bar right	1	
3	618249330	Packing material for Y-bar left	1	

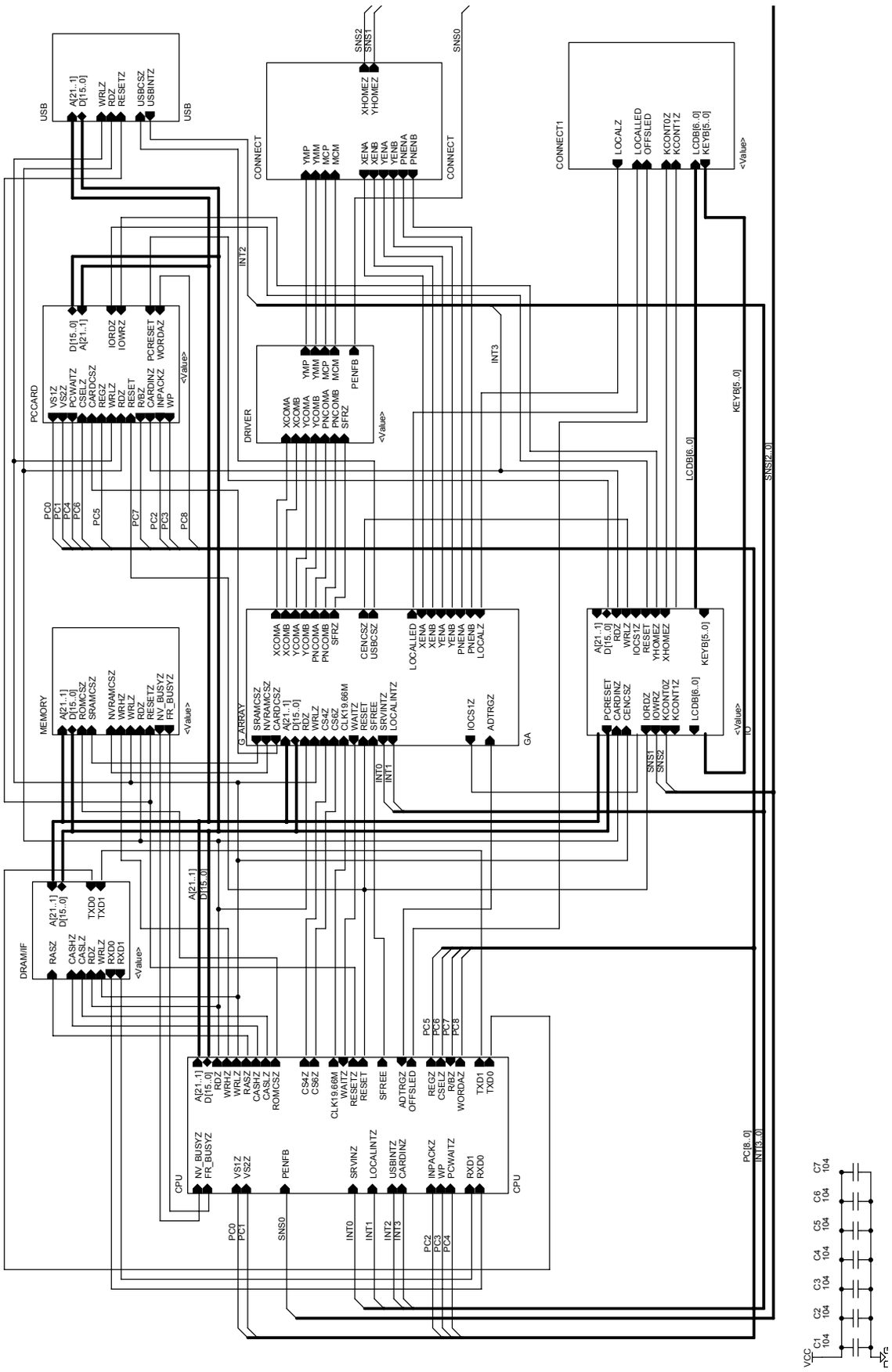
12. BLOCK DIAGRAM AND CIRCUIT DIAGRAMS

12.1 Block Diagram



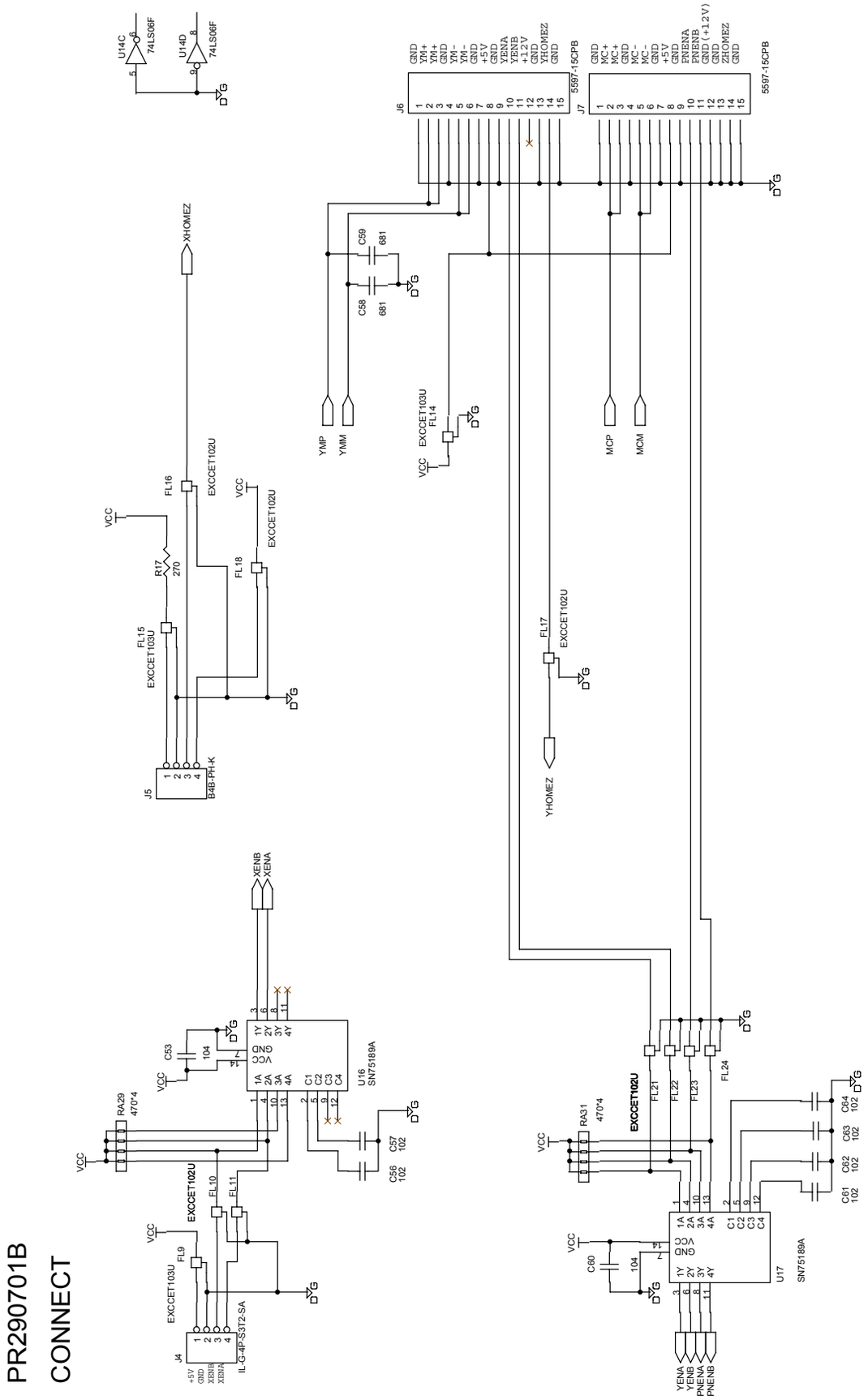
12.2 Circuit Diagrams

12.2.1 Main Board Top Section (PR290701B)

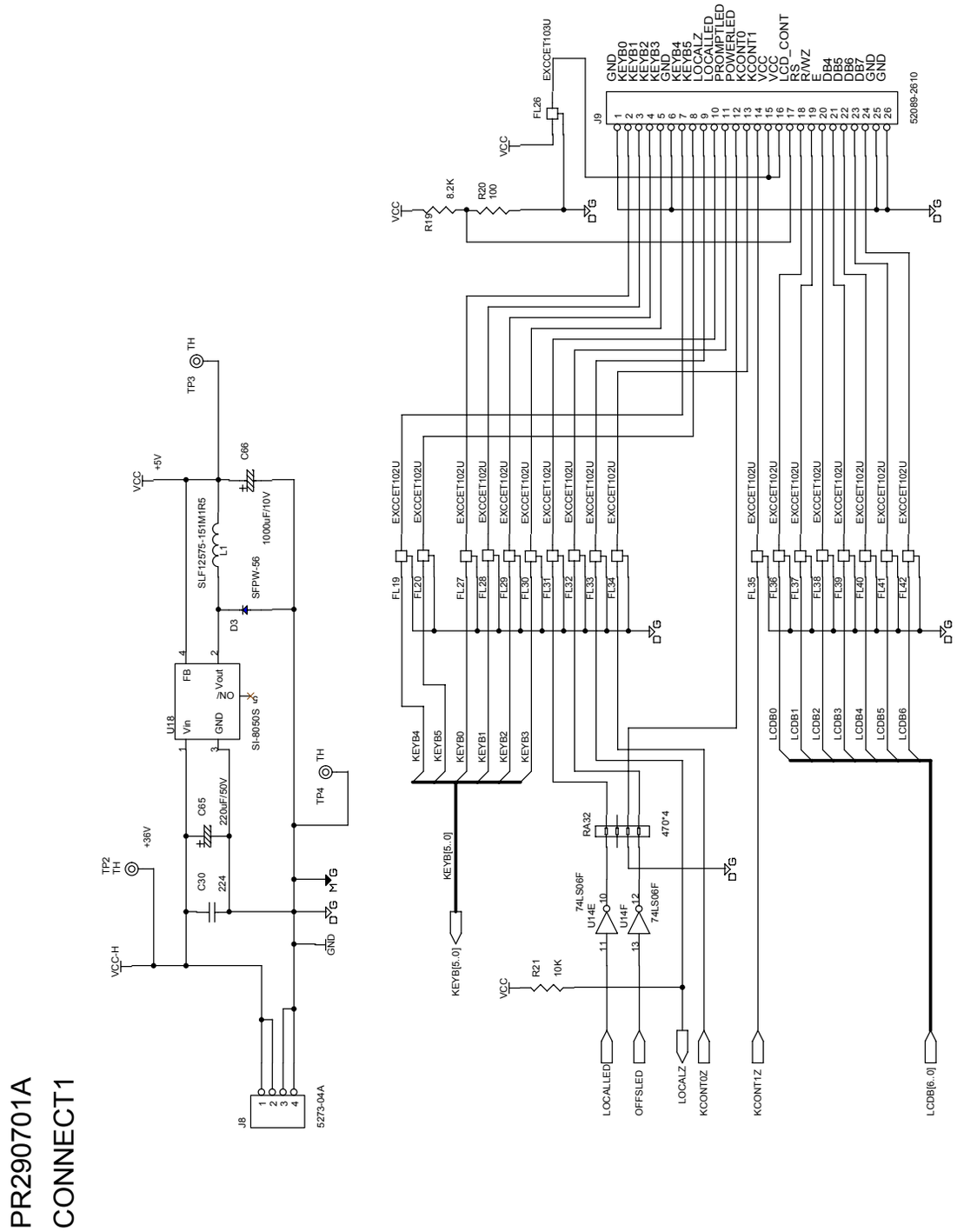


PR290701B
TOP

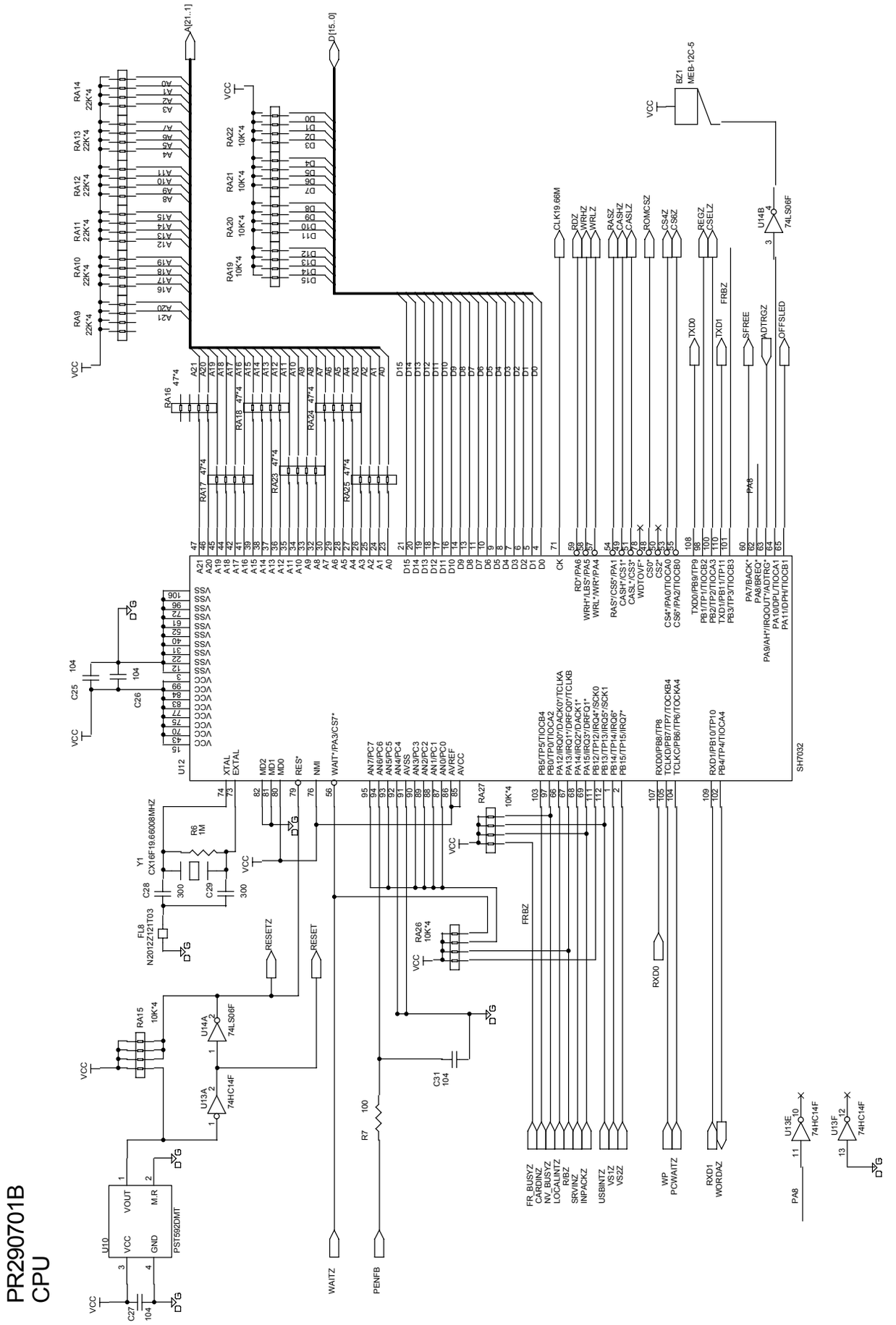
12.2.2 Main Board Connector Block Section (PR290701B)



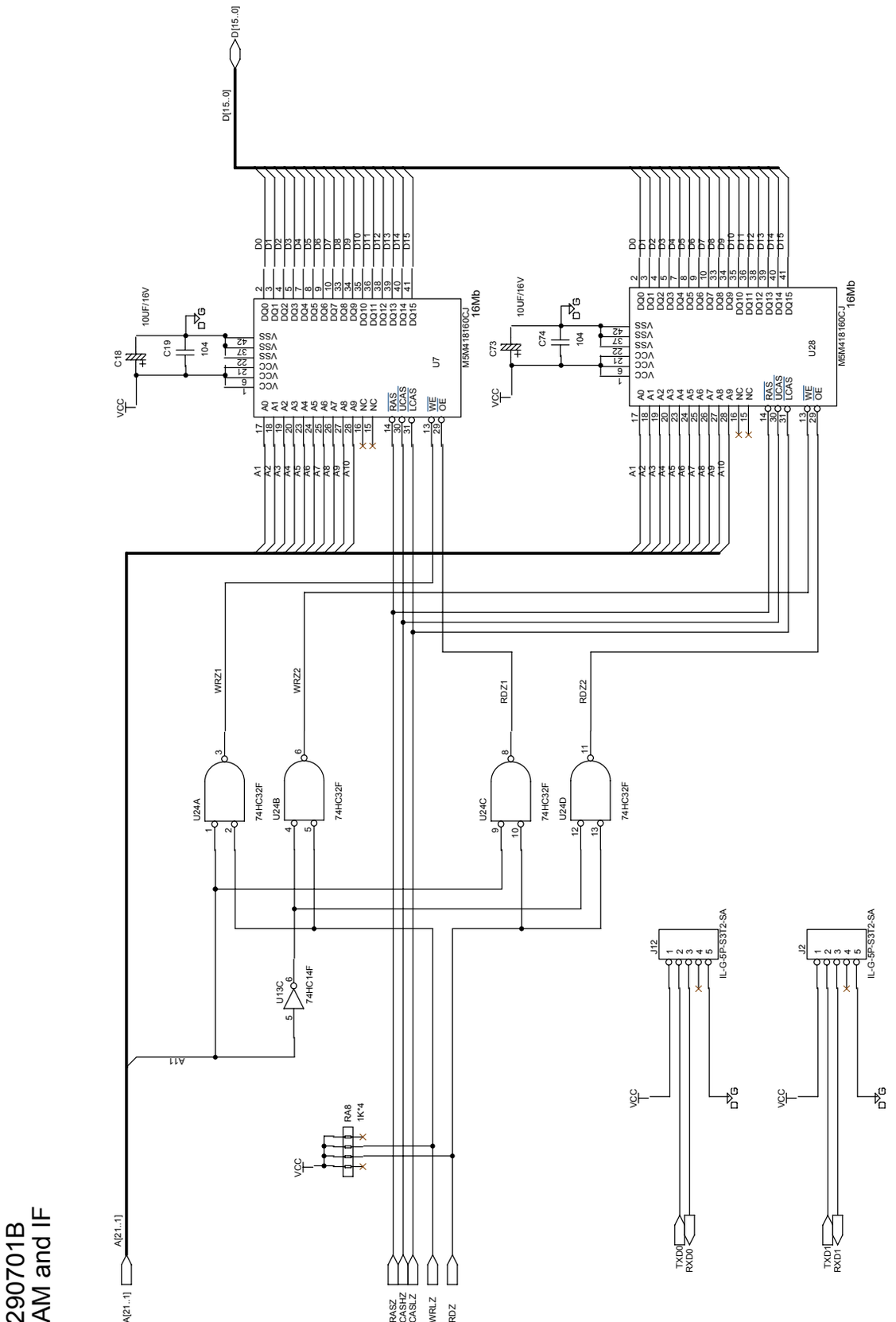
12.2.3 Main Board Connector 1 Block Section (PR290701B)



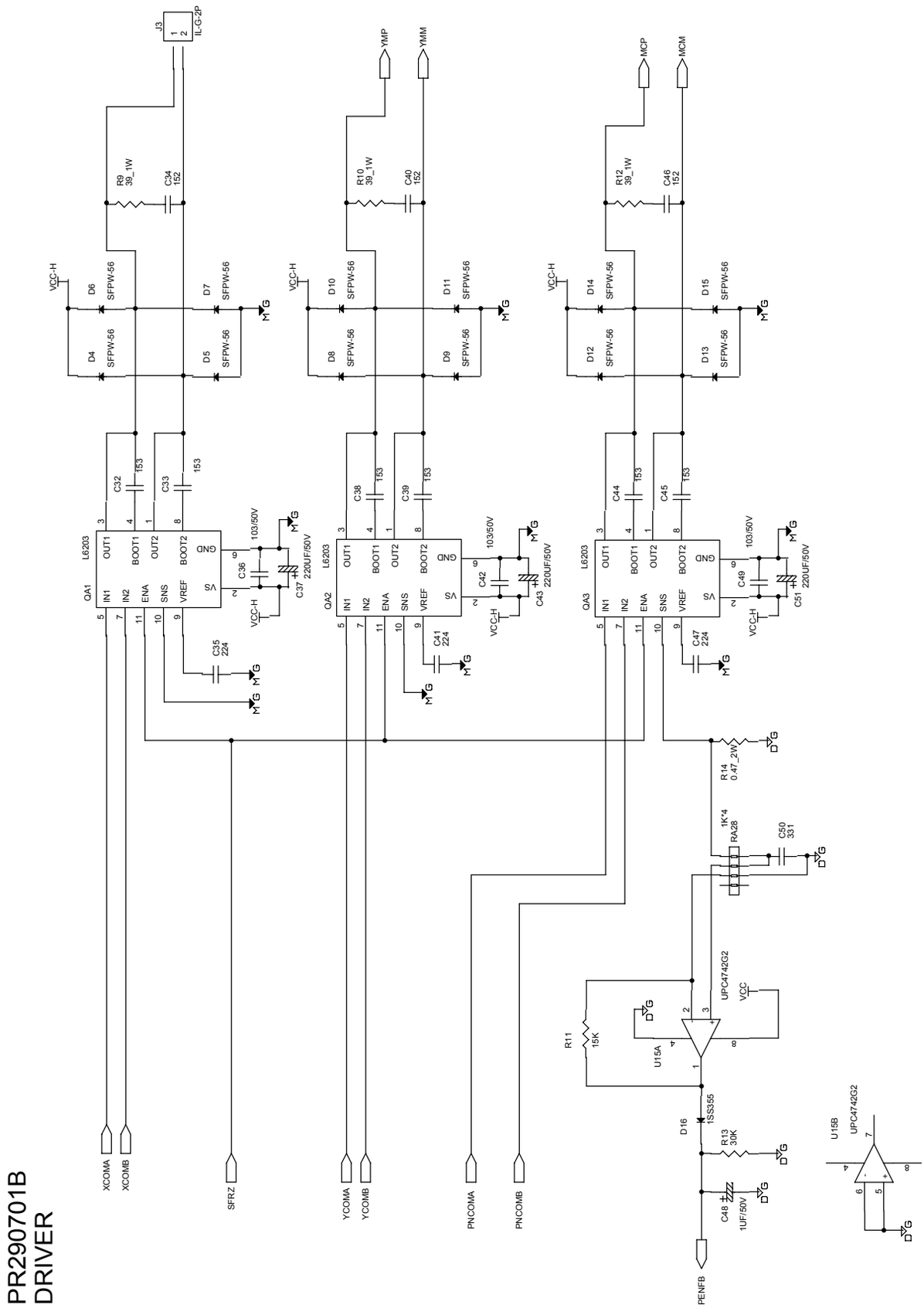
12.2.4 Main Board CPU Block Section (PR290701B)



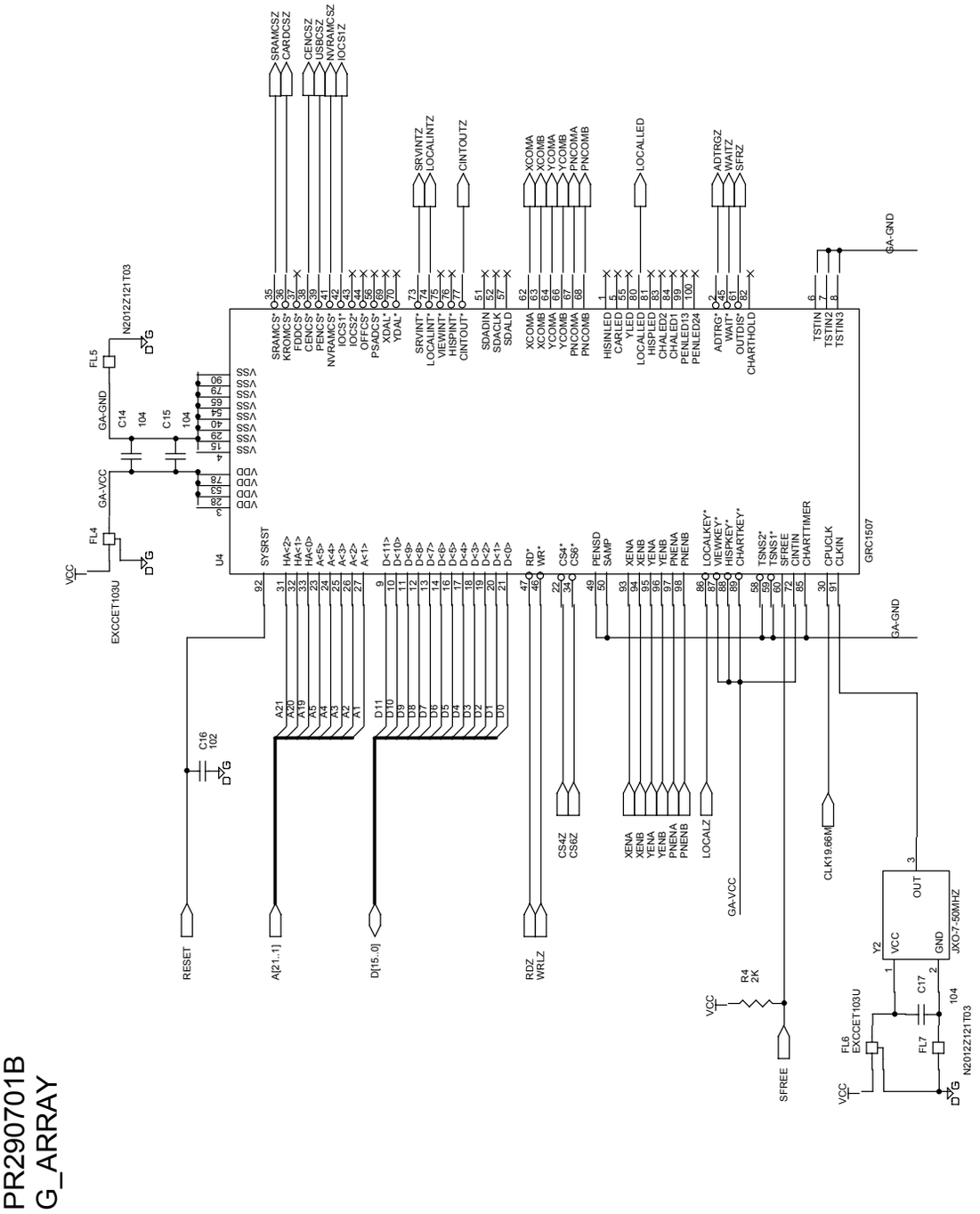
12.2.5 Main Board DRAM & Interface Section (PR290701B)



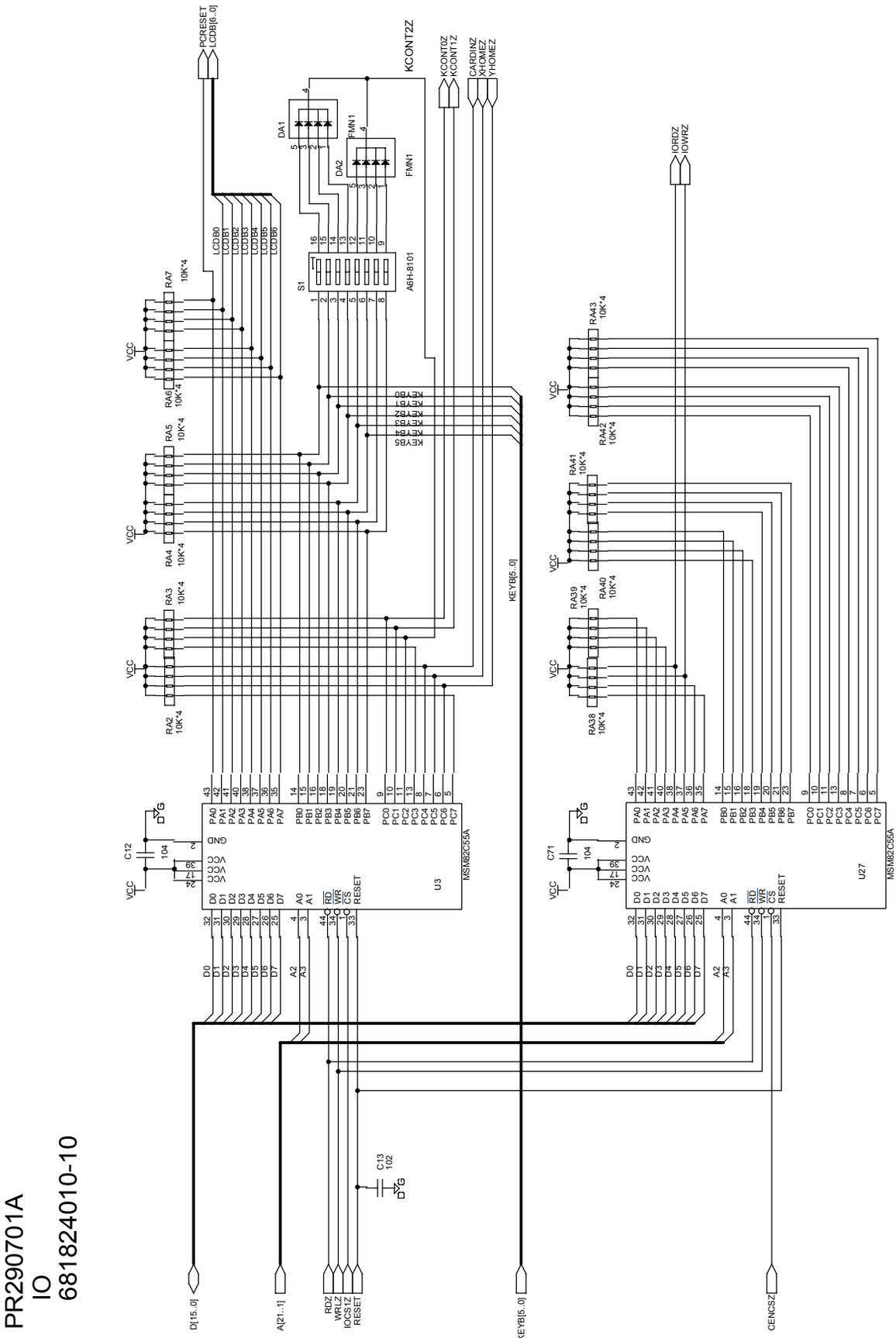
12.2.6 Main Board Driver Section (PR290701B)



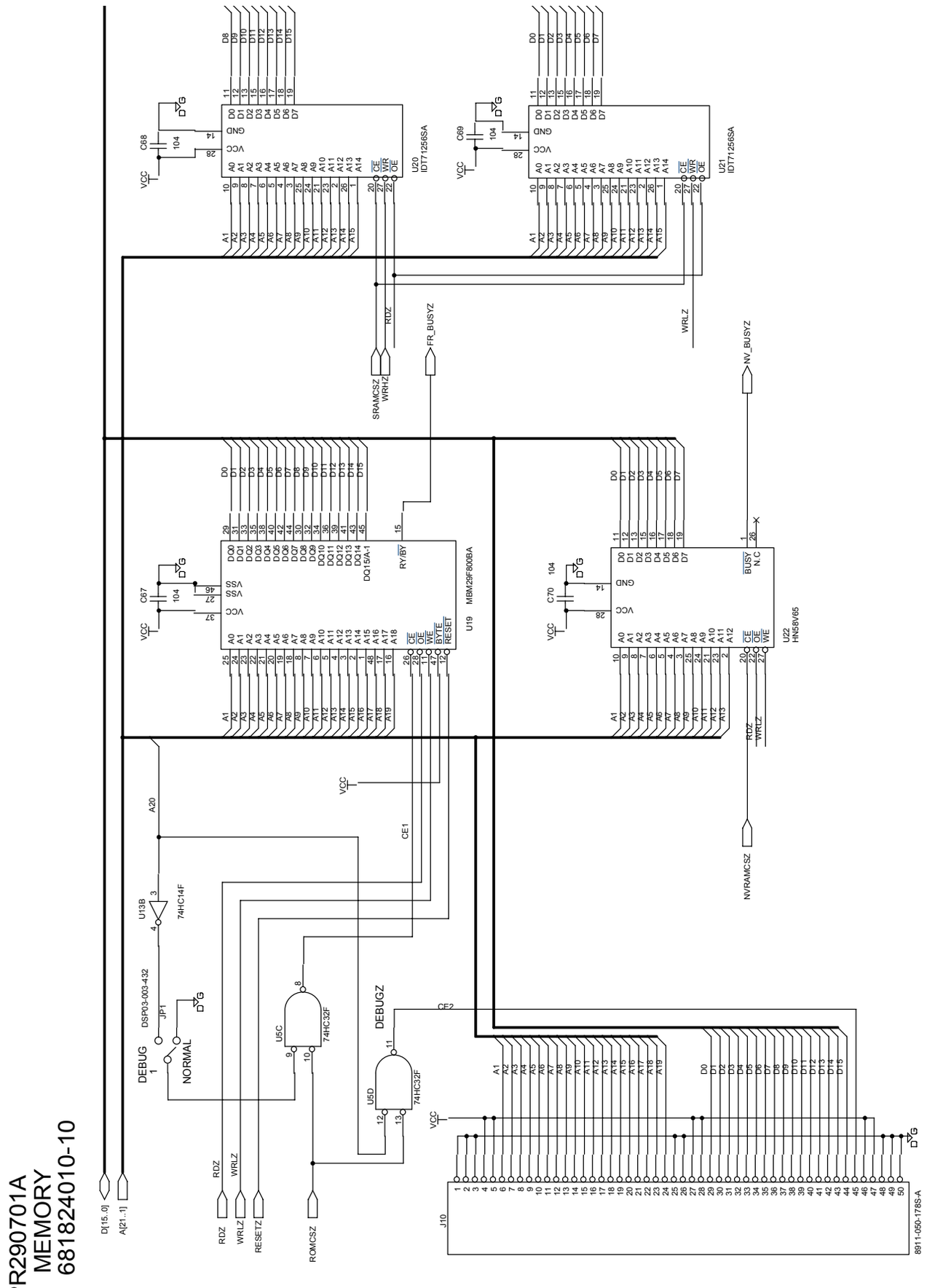
12.2.7 Main Board Gate Array Section (PR290701B)



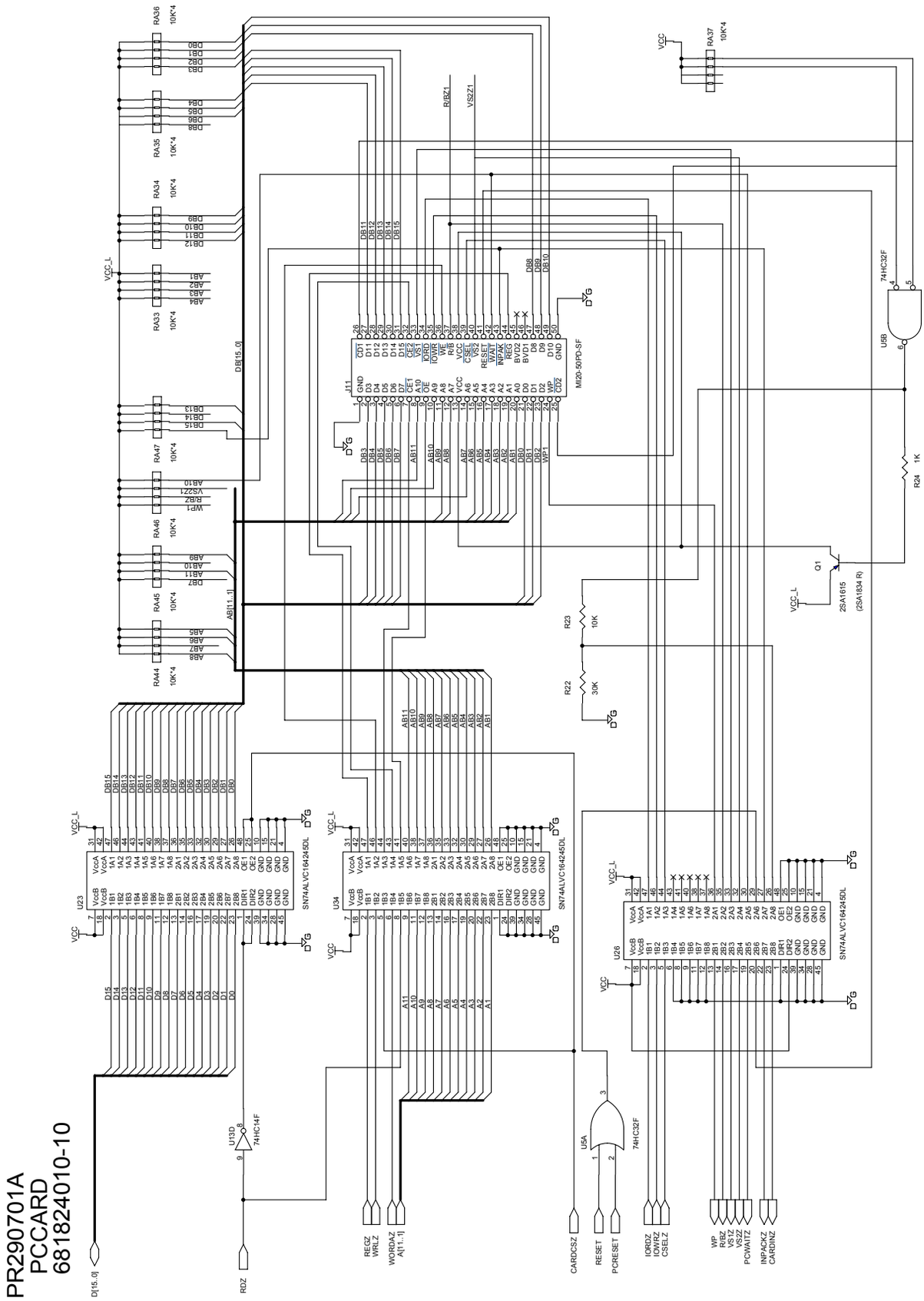
12.2.8 Main Board I/O Section (PR290701B)



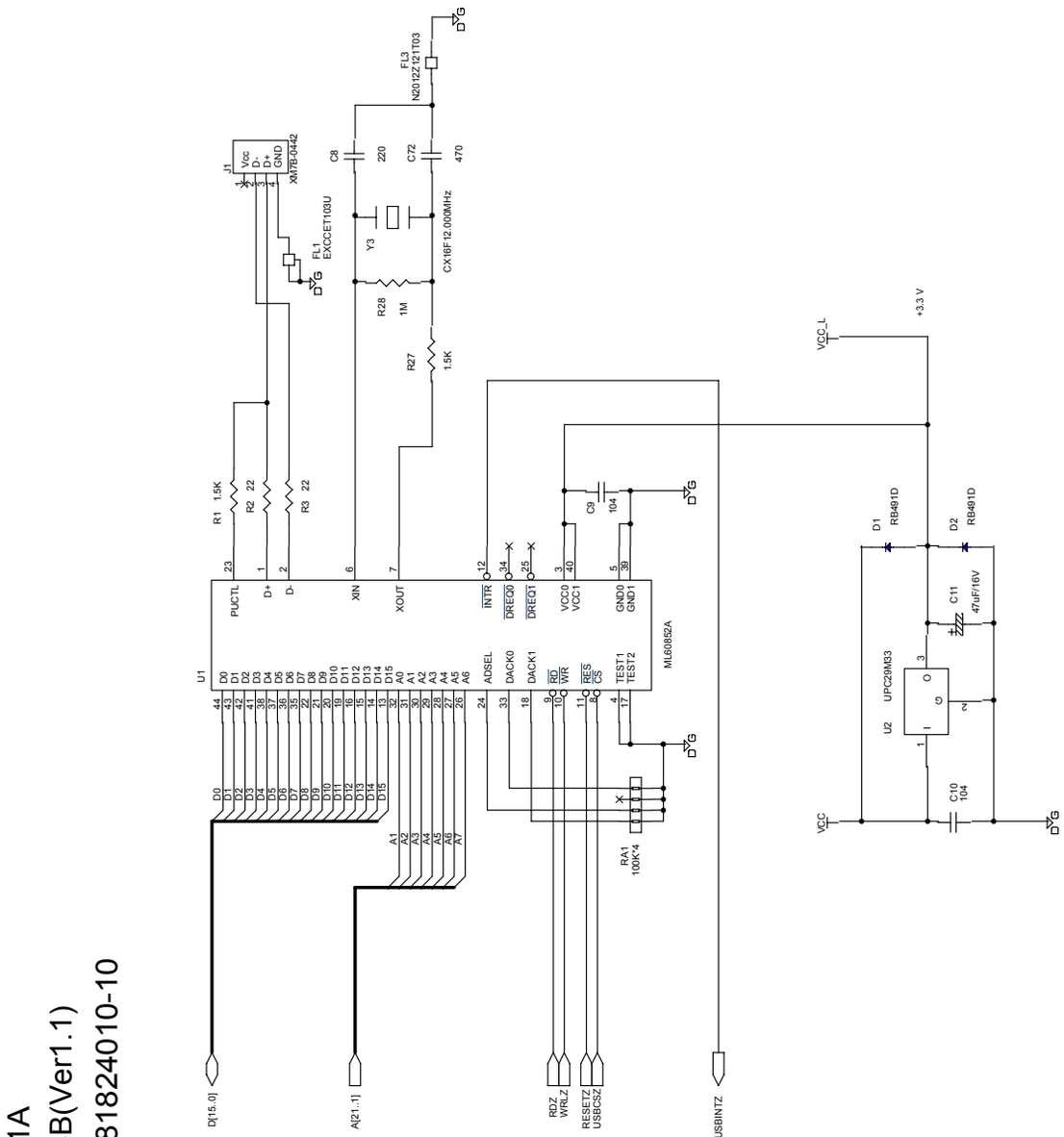
12.2.9 Main Board Memory Block Section (PR290701B)



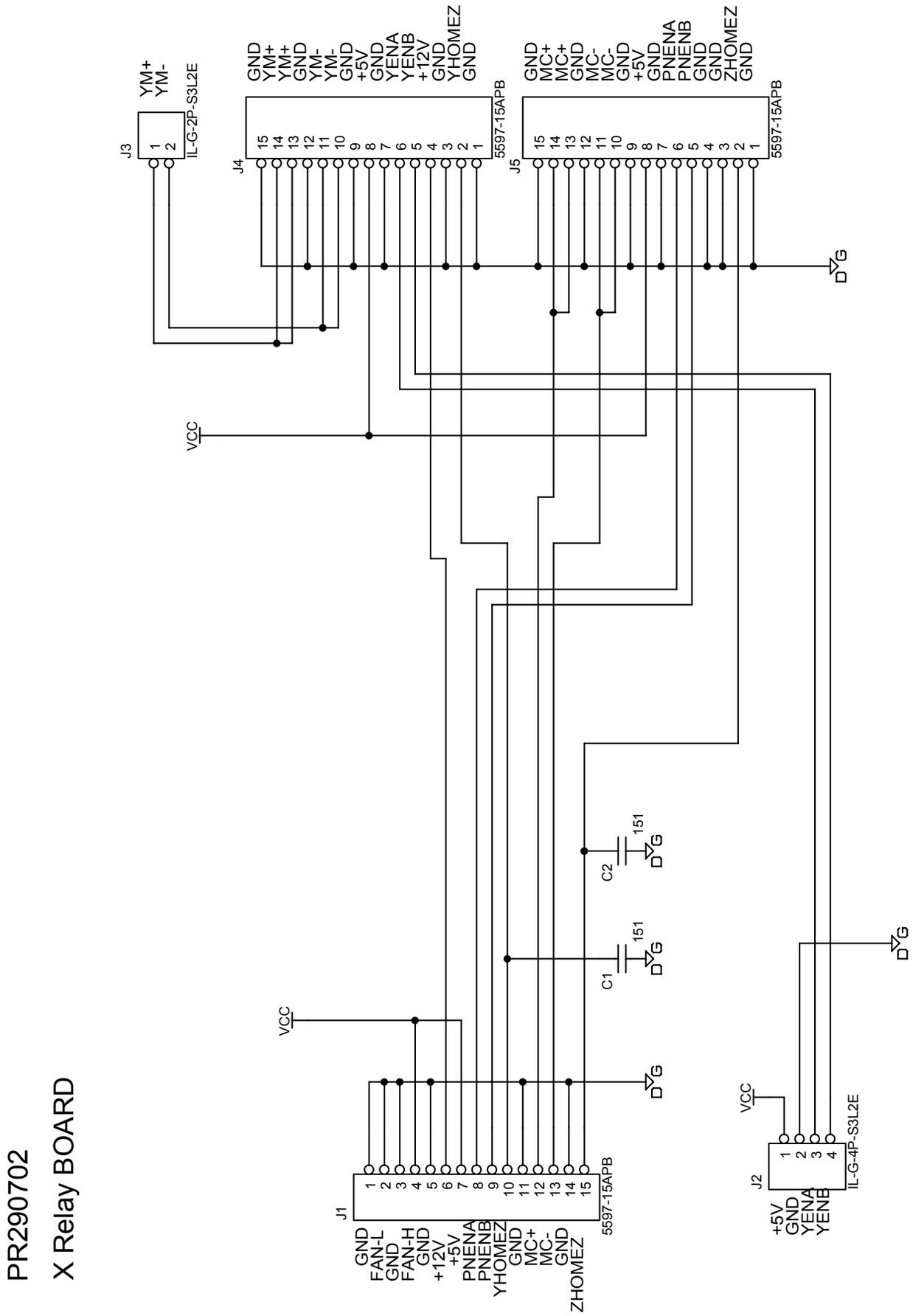
12.2.10 Main Board PC Card Section (PR290701B)



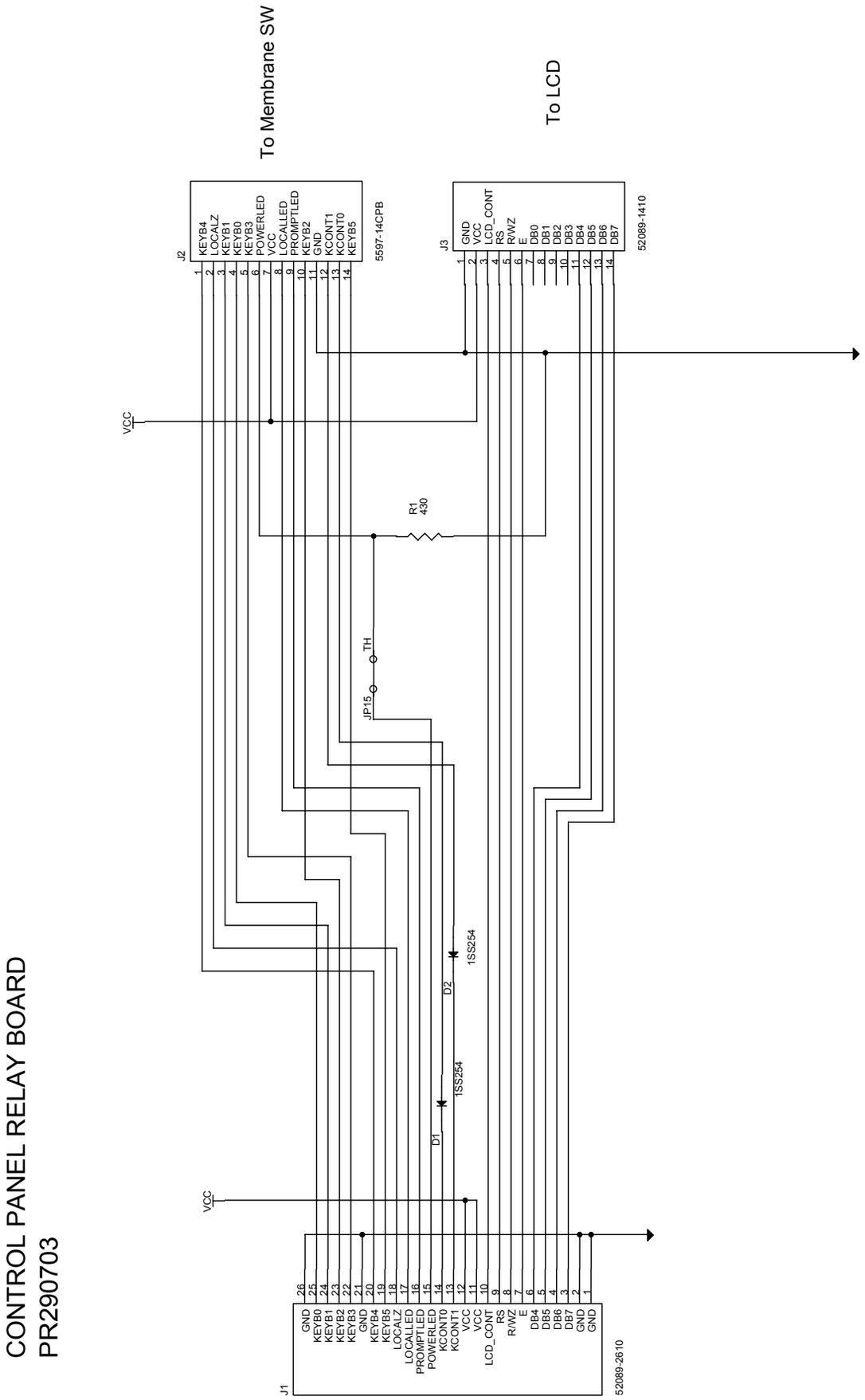
12.2.11 Main Board USB Section (PR290701B)



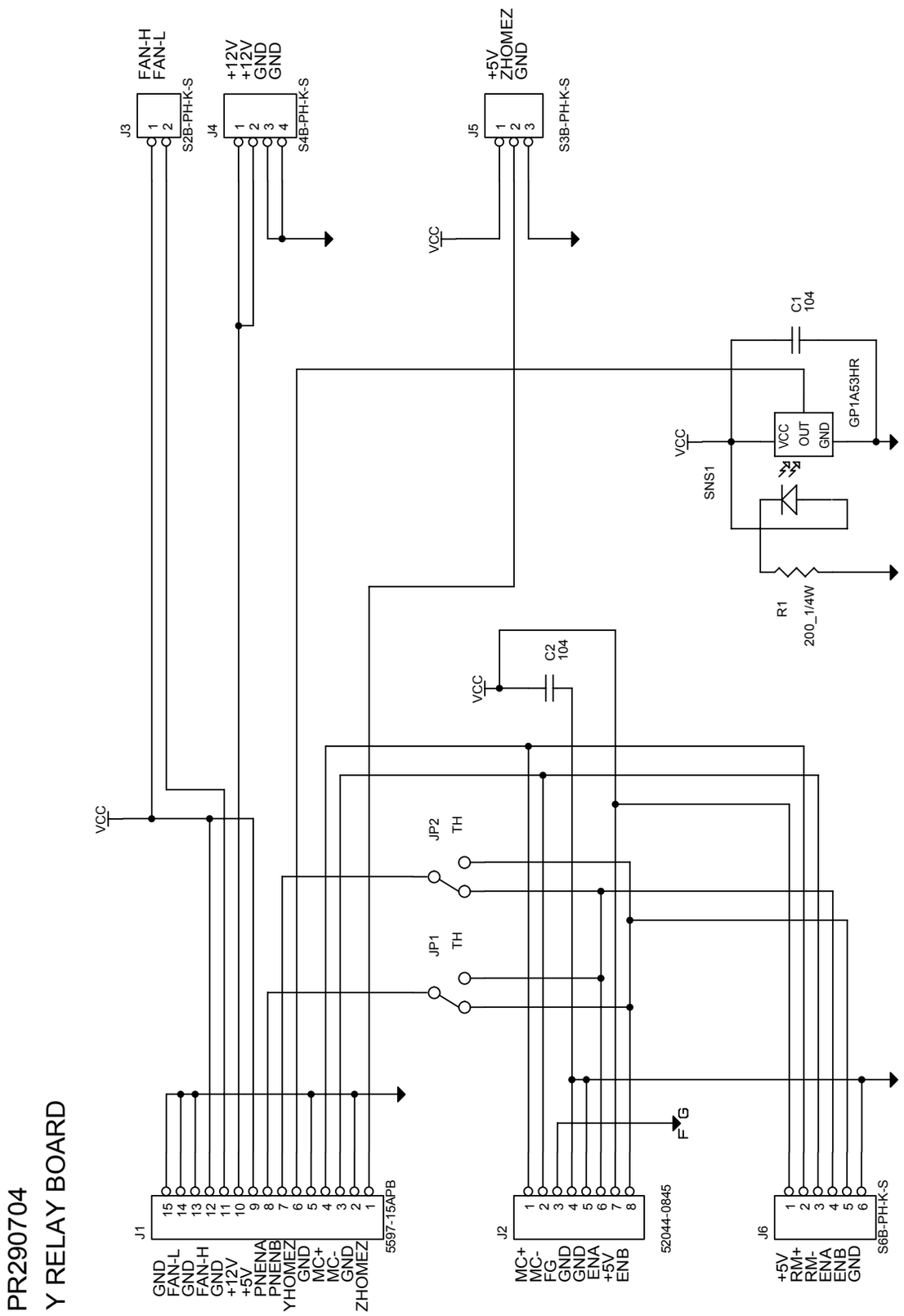
12.2.12 X-Relay Board Section (PR290702)



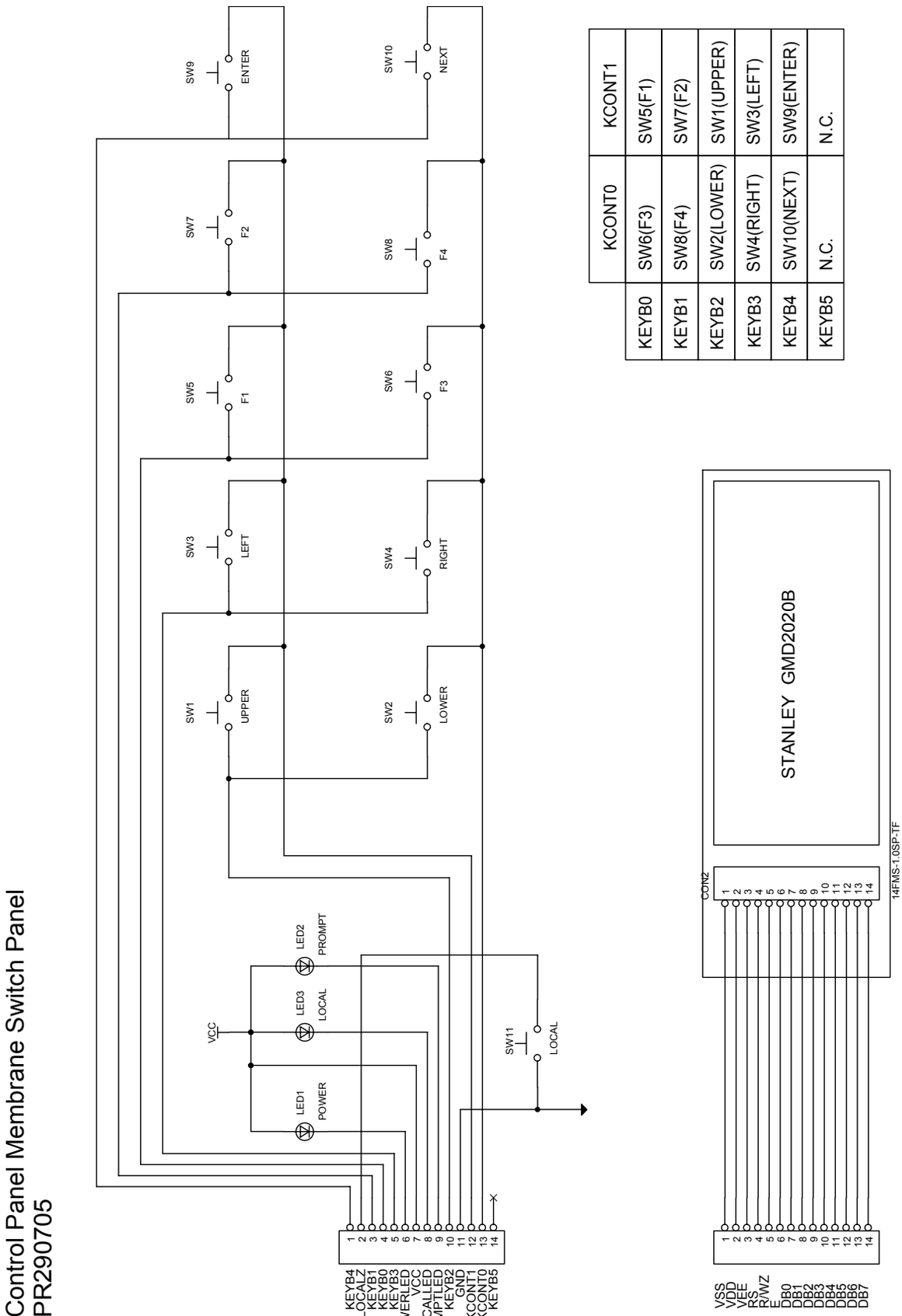
12.2.13 Control Panel Relay Board Section (PR290703)



12.2.14 Y-Relay Board Section (PR290704)



12.2.15 Control Panel Membrane Switch Panel Section (PR290705)



12.2.16 X-Home Sensor Section (PR290706)